

THURSDAY, MAY 20, 1897.

A PHILOSOPHICAL THEORY OF SELECTION.

Versuch einer philosophischen Selektionstheorie. Von Dr. Johannes Unbehaun aus Gotha. Pp. 150. (Jena: Gustav Fischer, 1896.)

THE object of this essay is to place the theory of selection on a purely deductive and abstract basis as distinguished from the concrete form in which it is made familiar to modern evolutionists through the writings of Darwin and Wallace. From the philosophical point of view, it is certainly desirable that we should realise that the particular kind of selection which is operative in species transformation, or in the production of artificial races, is only one phase of selection in the abstract, and any attempt to make our ideas on this subject more exact will be welcome to philosophical students of evolution. It is, in fact, somewhat remarkable that, while all working naturalists have now accepted the doctrine of evolution in one form or another, comparatively few have attempted to examine into the philosophical basis of the principles of selection. Dr. Unbehaun's discussion of the subject, if not exhaustive, is at any rate very suggestive, and as a contribution to a much neglected aspect of the philosophy of evolution the work may be safely recommended to English biologists.

The opening part of the essay, which treats of the principle of selection from the historical point of view, offers very little novelty. The author comes to the conclusion that the germ of the modern theory of selection is contained in the writings of the Greek philosophers. Empedocles appears to have had some hazy notions of the kind which did not produce much effect upon Aristotle, and the first definite utterance is attributed to Lucretius Carus the Epicurean. Those who take pleasure in reading into the poetic flights of ancient writers the discoveries of modern science, will derive interest from this section. There was a time in the history of science—especially in this country—when no new discovery was considered worthy of credence unless it could be shown to be in harmony with the views of the old philosophers. Those were the days when classical studies reigned supreme in our Universities, and when the would-be student of science was looked down upon as a poor creature. Happily for us the times have changed, and no worker in science is now seriously influenced by what the ancients thought. If he studies their writings, it is more from the point of view of academic interest than from a desire to find justification for his discoveries. The author of the present work does not appear to be acquainted with Prof. H. F. Osborn's most interesting discussion of the history of evolution in his book entitled "From the Greeks to Darwin."

As founders of the modern theory of selection, Dr. Unbehaun justly couples Darwin and Wallace. The distinction between evolution or descent with modification and selection is clearly grasped and emphasised by the former being called "Lamarckismus," and the latter "Darwinismus." Some pages are devoted to an exposition of the Darwinian principles, and the limited theory of selection elaborated by Malthus is also explained. There

are not many points in this section with which we are not already familiar in this country, but the author certainly puts the case in a way calculated to clarify some of the current notions concerning the action of selection. Thus, with respect to the interpretation of the term "struggle for existence," it is pointed out that there are three possibilities, viz. struggle unaccompanied by actual extermination, and therefore of no effect as a selective process; struggle with extermination, as in ordinary natural selection; and extermination without struggle, which may or not produce selective action. The consideration of this last contingency brings out very clearly the difference between the struggle of competing organisms among themselves and the struggle with external (inorganic) conditions of environment. The outcome of this discussion is the conclusion that concurrent extermination of individuals or races is indispensable for the process of selection—in other words, that selection is concerned only with the existence or non-existence of individuals or assemblages of individuals, whether actual or potential.

After a brief exposition of the extension of the idea of selection from the organism as a whole, to the component parts (Wilhelm Roux, 1881), the author discusses palæontological selection, a subject which appears to be equivalent to a consideration of the conditions which favour the preservation of fossil remains, and for the complete understanding of which it is essential to study the conditions of preservation and destruction of animals and plants going on at the present time. In connection with this, there is brought forward a principle which is termed lithogenetic selection (Johannes Walther, 1895), and which may be paraphrased by saying that, although a geological formation may be laid down over a wide area of the surface of the earth, the local preservation of the rock material is determined by local conditions, organic and inorganic. The attempts which have been made to refer the processes of evolution in inorganic nature to the action of selection in any form, are considered by the author to have failed on account of the untenability of the fundamental assumptions. After a summing-up of the conditions essential for the formulation of a philosophical theory of selection, the author discusses, in an appendix, some further points of historical interest; viz. the claims of Herakleitos among the ancients, and of Kant and Wells among modern writers, to have entertained the idea of a struggle for existence. The utterances of the Greek philosopher are considered hazy; those of Kant and Wells are, as Haeckel has already shown (1889), more to the point.

The real work of building up "a purely deductive theory of selection on the most general foundation" begins in the second chapter, and selection is defined (p. 34) as the process by which, out of a number of objects which are in any way related to each other, some undergo extinction, while others survive within the same interval of time. A critical analysis of this conception leads to the conclusion that, instead of through selection, it is possible to approach the problem from the point of view of a system of objects (organisms) having different degrees of duration in time. Here, again, there may be selection with or without further development, according as the process is accompanied by renewal or not. In the latter case, a system may become modified in its average

characters through selection by the mere persistence or survival of residues. If the process of selection continues, the system will ultimately disappear altogether. In the case of selection with renewal the system does not undergo extinction, and, therefore, this is regarded as the more general case, since selection without renewal may be regarded as the limiting case in which the number of renewals is always equal to zero. The consideration of the mode of renewal by the origination of new objects within the system is followed by a mathematical discussion extending over several pages, and leading to a further elaboration of the idea of selection.

The idea of adaptation in the abstract is next discussed, and the conclusion arrived at is that between an object and its environment there may be three kinds of adaptation; viz. by a modification of the object itself to an unchangeable environment, by a modification of the environment by an unchangeable object, and by mutual adaptability when both are changeable. Following this, there is a discussion of certain special cases of the abstract theory of selection, and some very suggestive observations are made with respect to the difference between selection due to mere survival, and selection due to survival accompanied by actual picking out. The point is a fine one, but it appears to be philosophically sound; and the author introduces a term to express the latter, which might be conveniently translated into "progressive" (*fortschreitende*) selection. A mathematical appendix to Chapter ii. discusses the relations between the three magnitudes: (1) the number of objects present at a given period of time; (2) the number of renewals; and (3) the number of extinctions, on the assumption that the number of renewals is determined by the number of objects already present.

The concluding chapter deals with the limitations of the principle of selection and its consequences, and the introduction of the abstract results into concrete cases. Most instructive is the section in which the author points out the inapplicability of the principle of selection which governs the organic world to inorganic nature, such as the development of astronomical systems or to the formation of chemical compounds. The author deals very severely here with Carl du Prel, who appears to be responsible for an attempt to introduce the idea of the struggle for existence into the formation of the heavenly bodies. One of the main contentions of the present essay is, in fact, that while the organic world is entirely governed by the principle of progressive selection, the evolution of inorganic nature can be referred to no such principle.

The essay, of which a very brief account has now been given, will find a place in the literature of the philosophy of evolution. It deals with the question only on very broad grounds, and does not appeal, therefore, to special schools of evolutionists, or to special biological creeds beyond the school of pure selectionists. In this principle of selection the author sees a universal law of development for organic nature, which can be made the basis of a positive philosophy of evolution. He recognises the part played by Herbert Spencer, although reserving to himself the right of being sceptical with respect to Spencer's developmental machinery. Dr. Unbehau's position is, perhaps, best defined as an attempt to recast the "Synthetic Philosophy" on purely Darwinian

principles. It must be borne in mind that, in commending the work to the notice of English readers, we have not the scientific specialist in view. There is no new discovery of fact announced, and most of the principles are already familiar to English students of evolution. The essay is a contribution to philosophy rather than to science. It is the mode of treatment—the manner of presenting the case—that constitutes the chief value of the essay. The endeavour to formulate the principles of selection in exact terms capable of mathematical expression is being made from many sides, and, as a method of attacking such questions, has for some time found favour in this country. It is somewhat surprising, however, to find that no reference is made by the author to the work of Francis Galton and Prof. Karl Pearson, who have done more in this direction than any other writers.

R. MELDOLA.

ILLUSTRATED HISTOLOGY.

A Text-book of Histology: Descriptive and Practical. For the use of Students. By Arthur Clarkson, M.B., C.M.Edin. Pp. xx+554; with 174 original coloured illustrations. (Bristol: John Wright and Co. London: Simpkin, Marshall, Hamilton, Kent, and Co., Ltd., 1896.)

A BOOK which is illustrated in so lavish a manner as the one before us, is calculated to catch the eye; but it must also bear the test of critical examination. By its coloured representations of the tissues, it challenges comparison with the well-known "Atlas of Histology" of Klein and Noble Smith, which was published some seventeen years back. Except, however, that it is smaller and less costly, it suffers grievously by the comparison. Klein's "Atlas" contained accurate representations made from preparations which were thoroughly up to date, and their description included much that was at that time new; so that the whole work had an unmistakable air of originality, and has remained of permanent value. The book before us has pictures which are pretty, as far as gaudy colouring can make them so, but which are, many of them, sadly lacking in accuracy of detail, or have been made from preparations fixed by imperfect methods. The very first figures we come to in the book furnish an illustration of this statement. In the representation of the stages of karyokinesis, the monaster stage is shown with nine chromosomes, each splitting into two. In a succeeding figure of the same stage their number is reduced to eight, and in the following two figures, representing the stage of metakinesis of the nucleus, we find, respectively, eight and ten chromosomes instead of eighteen in each! Then, again, in such a simple figure as the representation of human blood-corpuscles a spherical white corpuscle is represented of, at least, twice the diameter of the red corpuscles; while in the drawing of newt's blood, amongst a number of distorted red corpuscles, and some impossible white cells and blood platelets, a non-nucleated fragment of a white corpuscle is inserted, as if it were a normal constituent! The author expresses his obligations to Prof. Rutherford for having taught him the art of constructing histological diagrams. We

wonder what Prof. Rutherford's feelings will be when he sees the diagram of two liver lobules, which is presented in Fig. 121.

Not that we, by any means, wish to imply that all or even most of the illustrations are of the character above specified. On the contrary, if we put aside accuracy of detail, many give a representation of ordinary microscopical objects which will rejoice the heart of the average student, because he will find that his preparations are "just like the drawings," i.e. as long as he sticks to the stereotyped methods which are customary in certain histological courses. And this is the key-note of the practical directions which are given in the text. A few common methods of general applicability, such as have been employed with occasional modifications for the last twenty years, are described, but many of the most valuable modern developments are conspicuous by their absence. We look in vain for the methylene-blue¹ method of Ehrlich for showing nerve-endings, the invaluable method for tracing degenerating nerves described by Marchi, the bulk-staining method of Heidenhain. The student is not taught how to examine each tissue in the fresh condition, but dependence is almost entirely placed upon sections and stained preparations. Formol is not even mentioned, although it has been for at least three years in constant use by histologists. These are faults of omission which cannot be excused by the statement in the preface that "only the well-known and well-tried methods are given." The above are all well-known and well-tried methods, and all students of histology ought to be familiar with them. Nor are faults of commission lacking. We are told that a tissue treated with nitrate of silver, and exposed to good daylight, requires for staining "a few hours to a day or two"; whereas every histologist knows that a few minutes under these circumstances is abundantly sufficient. The gustatory nerve-fibres are shown continued into the central ends of the gustatory cells. It is stated to be "not as yet very clearly decided as to whether the cylinder cells, the rod cells, or both, are to be regarded as the peripheral terminations of the olfactory nerve." The lens is described as "somewhat lozenge shaped"; and so on.

It is not a little remarkable that a work of this sort, lacking, as it does, the first principle of a text-book, accuracy, and compiled, as it acknowledgedly is, largely from other text-books, should have been the subject of numerous eulogistic notices in the medical, scientific, and even in the public press. One would hardly expect the *Scotsman* to think that the plates "represent what ought to be seen in perfect specimens," and the *Western Daily Press* to find that "the details are specified with a delicacy and microscopic accuracy which reveal innumerable anatomical beauties"; and it is somewhat surprising that another reviewer finds "the semi-diagrammatic representations of liver" (!), amongst others, "very helpful," and yet another hails the work as "an important contribution to histological literature." We can only regret that we have been unable to endorse these and many other expressions of opinion of an equally favourable

character, which have been forwarded to us. For, in fact, the only part of the subject which bears any indication of having been specially studied by the author is that dealing with the ductless glands, especially the hæmal glands and the suprarenal capsules, and this shows a marked superiority of treatment. Had the whole book been written in the manner in which this part has been done, such eulogies might, perhaps, have been justifiable; but, as this is not the case, they entirely overshoot the mark, and can only lead to a feeling of disappointment on the part of the reader.

STUDIES ON EARLY MAN.

Studies in Ancient History. By J. F. M'Lennan. Second Series. Pp. xvi + 605. (London: Macmillan and Co., Ltd., 1896.)

IT is now many, many years since Mr. M'Lennan came before the public as an expounder of the beliefs and habits of early man, and we think that no one will deny to him the credit of having brought a trained mind and good powers of reasoning and deduction to his work. More than this, it must be admitted that he collected his facts with great care, and that although some of his results have not stood the test of time, they have at least served as finger-posts to point others to the right paths. More than twenty years have gone by since the first series of his "Studies in Ancient History" saw the light, and twenty years in the science of anthropology and its cognate subjects represent a vast amount of progress in these times. It was evident to Mr. M'Lennan himself that some of his views would have to be modified by the results of other workers, and though, alas, he never lived to re-edit a second edition of the "Studies," he was fortunate enough to have found a sympathetic supporter in his brother Mr. D. M'Lennan, who not only published as "a preliminary and polemical inquiry" "The Patriarchal Theory," but also a second edition of the "Studies" with notes by himself. Soon after this Mr. D. M'Lennan was himself carried off by death, and the late Prof. W. R. Smith undertook to finish the work which the two brothers had begun. About this time, however, Prof. W. R. Smith was deeply engaged in the study of Oriental kinship and marriage, and totemism, and he was also planning his series of lectures on "fundamental institutions"; it is evident that he had little leisure in which to arrange the labours of other workers. That little leisure, moreover, was broken in upon by the increase of the malady which subsequently caused his death, and as a matter of fact he left M'Lennan's work pretty well as he found it. Mrs. M'Lennan then determined to attempt the publication of all papers that were at all in a fit state, and she was fortunate enough to find not only a willing, but a most able friend in Mr. A. Platt, who as long as she lived assisted her in the work, and when she was dead, completed the labour of love which she had begun.

The second series of the "Studies" is divided into two parts; the first relates chiefly to kinship, totemism, marriage, the origin of exogamy, female infanticide, &c., and the second to the customs of the peoples of the Pacific Islands, America, Africa and Australia in these matters. Of the various chapters, only that on the

¹ The author is apparently unaware that methyl-blue and methylene-blue are two entirely different substances and have different histological uses, for he constantly uses the term methyl-blue where methylene-blue would be appropriate.

"Origin of Exogamy" has hitherto been printed. The reader will find during the course of his perusal of this volume that he is already familiar with a large number of the facts, and will be inclined to wonder why they are reproduced here without reference to the works in which they have already been printed; but it must be remembered that the works of W. R. Smith, Frazer and others have been published since the death of M'Lennan, and to add references of this kind was clearly outside the duties of the editors. Again, some of his views are given more fully, and others are disproved by an overwhelming mass of evidence in the splendid publications of the American Bureau of Ethnography which the Government of the United States have issued during the last fifteen years; but we cannot blame the editor for being silent on these points. M'Lennan began to work and to collect materials when the study of comparative ethnography was in its infancy, and he endeavoured to study everything for himself and at first hand. As other workers entered the field, and studied to specialise their knowledge, his task became greater and greater, until at length he was unable to cope with it; still in many respects his work is thorough, and even when his impressions and deductions from facts are wrong, they bear an honesty about them which is lacking in the work of more modern investigators. In a book dealing with so many peoples and countries it would be easy to pick holes and to raise an argument with tolerable frequency; and although we do not propose to do either the one or the other, still we must protest against the quotation on p. 520. Here it is gravely stated that the Zodiac was known in Egypt as early as B.C. 5800, but there is no evidence whatever extant on which to found such a decision; the home of the Zodiac was the country lying to the north-east of the Arabian Peninsula, and though it may have been known to both the Semitic and non-Semitic inhabitants of this region at such an early period, there is no proof that it was. Finally, we cannot help regretting that Mr. M'Lennan's "Studies" are without an index, for, in our opinion, one-half of their usefulness and value is lost thereby.

OUR BOOK SHELF.

Ferrets, their Management in Health and Disease; with Remarks on their Legal Status. By Nicholas Everitt. 12mo, pp. xv + 209. Illustrated. (London: A. and C. Black, 1897.)

PROBABLY many of our readers who have not been brought up in the country would be shy of handling a ferret; but if they attend carefully to the directions given in this little volume, they may set aside their fears for the future. Admirable instructions are also given as to the management of these animals in health and in sickness, and likewise how to use them in the field; while a *résumé* of the legal status of ferrets will probably be useful to many. So far, indeed, as the breeding and management of these little mustelines are concerned, we may say, to use an expression of the author, that "what he does not know is not worth knowing."

Unfortunately, in common with many writers of works of a similar kind, the author has thought it necessary to give a preliminary chapter on the natural history of the ferret. Here he is in hopeless confusion. Although he describes the ferret as a species of *Mustela*, he says that it belongs to the genus *Putorius*; and further informs us

that it is a natural species, whose native home is Africa. He also states that the beech, or stone marten, is a British species, and makes several remarkable assertions concerning other members of the group. The author may be reminded that there are writers on natural history since Buffon; and should the work reach a second edition, he would do well to engage the services of a competent naturalist to rewrite the first chapter. R. L.

Catalogue of the African Plants collected by Dr. F. Welwitsch in 1853-61. Part i. Dicotyledons. By W. P. Hiern. Pp. xxvi + 336. (London: Printed by order of the Trustees of the British Museum, 1896.)

DR. WELWITSCH, although an Austrian by birth, occupied the position of curator of the Lisbon Botanic Garden and Museum, when he was selected, in 1851, by the King of Portugal as naturalist to an expedition for exploring the Portuguese possessions on the West Coast of Africa. Between this date and 1861, he made very large collections, chiefly of plants. Although Dr. Welwitsch died in 1872, his collections have till recently remained unedited, partly owing to a dispute as to their ownership between his Trustees and the Portuguese Government, which ended in the Court of Chancery, partly owing to the difficulty in finding a compiler and editor. This office was finally placed, by the Trustees of the British Museum, as far as the flowering plants are concerned, in the very competent hands of Mr. W. P. Hiern, who has now brought out the first part, comprising the natural orders of Dicotyledons from Ranunculaceæ to Rhizophoraceæ. The work has been one of great labour, a large number of new species and some new genera being described; and we may congratulate the systematic botanist on so important an addition to our knowledge of the flora of Tropical Africa. A. W. B.

Pioneers of Evolution from Thales to Huxley; with an Intermediate Chapter on the Causes of Arrest of the Movement. By Edward Clodd. Pp. x + 250. (London: Grant Richards, 1897.)

MR. CLODD has produced an interesting book, in which is told "the story of the origin of the Evolution idea in Ionia, and, after long arrest, of the revival of that idea in modern times, when its profound and permanent influence on thought in all directions, and, therefore, on human relations and conduct, is apparent." The volume is divided into four parts, which deal successively with the Pioneers of Evolution from Thales to Lucretius, the Arrest of Inquiry, the Renaissance of Science, and Modern Evolution. It should be read by the great body of science students in our University Colleges and technical schools, who, too often, in following special branches of science, lose sight of the great generalisations which have, during the latter part of this century, so completely altered the complexion and tendency of ideas on every subject of thought.

The author sketches the chief results which have come from the recognition of the principles of evolution, not only in biological provinces, but in all departments of human knowledge; and he has, in so doing, produced an attractive and wonderfully clear little volume.

It may be worth while to point out that the statement that nebulae are "masses of glowing hydrogen and nitrogen gases" (p. 164) needs correction; for nitrogen, as a nebular constituent, is now relegated to the limbo of departed ideas. Mr. Clodd should have verified his statement by himself taking the advice which he offers Lord Salisbury on p. 165. The reference to "the complex jelly-like protoplasm, or, as some call it, nuclein or nucleoplasm" (p. 103), also needs to be made accurate, for in its present form it will give readers the idea that the three words we have italicised are synonymous. The book contains good portraits of Darwin, Russel Wallace, Herbert Spencer, and Huxley.

LETTERS TO THE EDITOR.

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Immunity from Mosquito Bites.

WITH the mosquito as he is, and as he has been for forty-six years, in the territory on both sides of the Mississippi River from Memphis, Tenn., to New Orleans, and along the Gulf of Mexico for five hundred miles, in the cypress swamps, palmetto and cane-brakes, on the lower river lands, winter and summer, following my business of telegraphy, I am intimately acquainted; and from this long and varied experience can say definitely for myself that I have no immunity from their attacks. Every bite yesterday, or forty-six years ago, produced a wound, generally a white, callous swelling from one quarter to three-quarters of an inch in diameter, and as high as a quarter of an inch, which remains forty-five to sixty minutes, with more or less pain in all, and fever in many cases. And this whether it was the bite of the fierce gallinipper of the swamps, which stings through a flannel shirt, or the little zebra-legged thing—the shyest, slyest, meanest and most venomous of them all—which invades the heart of the city, away from the foliage, the common haunts of the other varieties.

While I have to be vigilant in warding them off, my children sitting around are comparatively undisturbed, and other people suffer nothing from them; so it seems the mosquito has the power of selection.

But if I have experienced no immunity from mosquito poison, I have enjoyed it other ways, which it may be interesting to state. When I qualified as an operator in Mississippi, I was given a station to which was attached fifty miles of wire, which I was to keep in order, repair breaks, remove leaks, and replace insulators. The line was mostly on trees, few poles being used, and the foliage, including vines, had to be kept down. The latter were especially dangerous and of rapid growth, and among them was the *Rhus toxicodendron*, but I knew nothing of its qualities; and when I came across it, which I did at the very outset, I cut it at the roots, and taking hold of it with naked hands, pulled it off the trees and poles without ever experiencing the least effects from it. Others are poisoned by its touch, and are laid up for weeks and months, their sufferings being produced by periodical eruptions appearing annually on the hands, face or neck for many years.

DAVID FLANERY.

Memphis, Tenn., U.S.A., April 28.

Identical Customs of Dyaks and of Races around Assam.

THE deplorably backward state of anthropology in England and India is effectually exposed by the recent publication of Mr. Ling Roth's "Natives of Sarawak and British North Borneo." Beautifully illustrated, exhaustive in treatment, too expensive to be procurable among working students, and exasperatingly unwieldy, it is a monument of shame to us, as a race; the more so when we see that only 700 copies are to be issued, "no cheaper edition" guaranteed! and the beautiful plates to be destroyed!

As a record of our apathy and ignorance it could hardly be surpassed. Here is a really wonderful work, lavishly got up, two huge volumes full of the most valuable matter, quoted from the best authorities, unlimited speculation as to where these races came from, and as to how some of their singular customs arose, such as "head-hunting," &c., and, as far as I can see, not the faintest suspicion that these customs came, with the race itself, from Assam.

The late Captain Otto E. Ehlers, with whom I spent ten days here in the early part of 1895, was so impressed with the fact, at last, that these Abor-Noga savages around Assam are the race stock whence the Batta-Dyak developed, that he determined to first examine and collect among our groups, and later on visit Borneo. With this object in view we visited together some of the eastern Nogas. He then went among the little-known "Apa Tanangs," and later on the "Nogas" along the south border, "A-nga-mi" and others, making huge collections. Unfortunately he contracted fever, and was ordered off for a long sea voyage, intending to visit Papua so as to collate the races there, closely allied to our Kol; and had intended taking

Borneo on the return voyage. His untimely death in Papua put an end to it all, and what has become of his notes and collections I do not know. This, however, I can vouch for, *i.e.* that he was thoroughly convinced that in and round Assam we have a huge mine of anthropological lore, of which our men of science have not the faintest suspicion, and to which fact I have now for some years in vain endeavoured to draw attention.

In reading Mr. Ling Roth's work, it becomes at last almost wearisome to note the identity of the Bornean customs with those of our semi-savage races, down even to trivial details, the only marked differences being those due to developments through contact with more advanced races later on, such as the early and pre-Muselman, and Brahmanical influences, *vid* Java. One of the greatest stumbling-blocks in collating our races with those of the Archipelago is the persistence with which languages are looked upon as the main tests of racial affinity. Occasionally language is invaluable, but at other times, as in this case, it stands a bad second, or even third, both custom and physique being more reliable. We often have curious proofs of this even here, on a small area. For instance, I am now endeavouring to get a collection of the peculiar armless fringed jackets worn by the men among E. Nogas, Mishmi, Miri, Apatanang, Mikir, Kasia, Garo, Kuli, &c. I have seen these being woven by

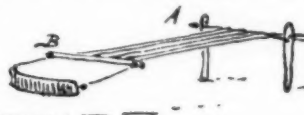


FIG. 1.

Noga women, the loom simply two sticks in the ground, with a cross-piece (Fig. 1, A), to which the narrow web is attached; another stick, B, at about six feet distant from

A, and over which the threads pass, is held tightly by a strap and strings which pass round the weaver's back, as she sits on the ground.

The small piece of cloth when finished, with patterns often woven in of coloured cotton or goat's hair, is some 4 feet long by 8 inches or 10 inches wide. The ends of threads form a fringe, thus (Fig. 2):—



FIG. 2.

Now, two of these pieces are sewn together, so as to leave a hole in the centre (Fig. 3):

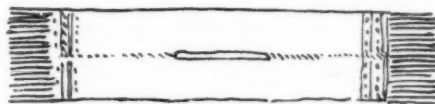


FIG. 3.

and then, after turning over, are sewn down the sides, so as to leave arm-holes (Fig. 4).

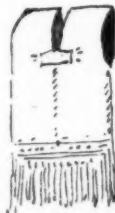


FIG. 4.

The whole thing is too methodical, and identical, to be an accidental resemblance—all are practically alike in details of construction; yet we not only find this jacket among all these tribes, but among the Dyaks, a proof (among many others) that, as a racial relic, it is older than the languages of these races around Assam.

But the lists of identical customs, seen between these races here, and those in Borneo, from "head-hunting," and its causes, building on piles, tattooing, &c., down to such trivial details as the value attached to the hornbill's feathers, curious fences, is interminable, quite impossible to put in a letter.

What I desire to point out is the need for systematic research among these races around Assam and in the ultra-Indian peninsula; they are practically unknown to anthropologists, and unless soon taken in hand, a vast amount of most valuable history will

be lost for ever. Some of the most valuable racial curios are now actually unprocurable. The long straight swords of the Mishmi, in the extreme east, were formerly found among all the races north of the valley as far west as the Kuki, and are now a tradition only. The Noga "Kyep," hide cuirass, identical with that of the Niasi, west of Sumatra, are impossible to get hold of, though common here thirty years ago—firearms rendering them useless.

An organised army of intelligent workers is badly wanted to save the stores of unwritten history seen in *customs* among all these races. They are pre-Aryan races, and if but a tenth of the time and money now being lavished on the Aryan remains, here and at home, were devoted to these far older, and far more interesting races, the result would astonish home folk. The races of the Pacific, and Archipelago (Australia included), came from India, as Polynesian investigators well know, but cannot easily join the proofs across the Malayan region.

Can nothing be done to arouse attention to this matter? Some of the customs are of the greatest possible value in the elucidation of the development of early human institutions such as marriage; and in the *Journal of the Asiatic Society of Bengal*, vol. lxi. pt. ii., No. 3, 1892, pp. 246 to 269, I drew attention to one of them in "The communal barracks of primitive races," a vast subject, on which alone there is enough to occupy many experts for several years, as its ramifications extend from West Africa to Eastern Polynesia, and from the Himalaya to New Zealand.

There are many willing and capable workers in the East, but scattered over a vast area; a central "association" is needed, say at Singapore, to and from which communication is easy. An association of scattered students, rather than a new society, is wanted, and it would cost very little if the local branch of the Asiatic Society took the matter in hand as a branch of its work, charging those engaged in research a transmission fee on all that passes.

At the present moment I am most anxious to get in touch with some one in Formosa, so as to procure photos of the savages, their houses, &c., to compare with our Noga, who, I believe, are the same race stock, but I am not able to get the names and addresses of workers there; a central association at Singapore could very probably afford help in such matters.

The Anthropological Institute of Great Britain and Ireland is too far off to give this aid; besides, it is not a live society, or anthropology would not be in such a pitiable slough as we see it here. The collection of life-sized nude nondescript effigies in the Indian Museum reveals our state at a glance; they are to amuse the hundreds of natives who gaze at them daily. The value of it as a collection is measured by the *numbers* who stare and get thoroughly mystified, and this is proudly published every week. As an ethnological collection it is enough to drive an expert mad.

S. E. PEAL.

Sibsagar, March 31.

A Curious Luminous Phenomenon.

THE phenomenon mentioned on p. 31 of NATURE (May 13), is undoubtedly subjective, and has to do with the fatigue of the retina.

I observed it very markedly in the case of an orange round which I was skating on the open-air ice-rinks in the Engadine; all the country about being white, and the ice, too, being dazzling.

The blue-violet margin to the orange was zero, or at a minimum, when I fixed my eye on a point on the orange. It was at a maximum when I glanced quickly round the orange, or when the orange rolled. In the latter case it was unsymmetrical and "trailed."

I satisfied myself, by the experiments that I tried, that the portion of the retina protected from the white glare by the image of the orange, received an impression of blue-violet light when the protection of this image was removed owing to the movement of the eye or of the object; but that this peculiar condition of the portion of the retina in question was very transitory.

It is possible that temperature affects the phenomenon indirectly; since the eye may be more unsteady, and wander more, when the temperature is low.

Experimenting in England with less white and dazzling ice and landscape I found the phenomenon less marked. It was very brilliant and beautiful in the Engadine.

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I feel sure that if any observer notices the effect of keeping his eye fixed on some point of the body so as to keep the image on a constant portion of the retina, he will come to the same conclusion as myself.

W. LARDEN.

R.N.E. College, Devonport.

Röntgen Rays.

I HAVE had a focus-tube constructed, in which the distance between the electrodes can be varied, after Mr. Campbell Swinton's pattern, but in which the kathode is made the movable electrode, and the adjustment is made by magnetic control. This is effected by attaching a disc of soft iron to the sliding-rod of the kathode. The advantage of this arrangement is that the kathode can be moved up to, or away from, the anode while the tube is working, so that the best effect can be at once obtained. The resistance is, as Mr. Swinton has pointed out, greater when the electrodes are close together than when they are far apart. The best fluorescent effects are, however, obtained when the electrodes are so close together (about one millimetre apart) that a very bright arcing discharge occurs between them. The screen is now lighted up much more brilliantly than when they are at any other distance apart. The very bright fluorescence is only obtained when the arcing discharge occurs. If the electrodes are brought any nearer together, the platinum anode becomes red-hot, the fluorescence fails, and the resistance of the tube increases very rapidly. I do not remember having seen this noted before.

Edinburgh, May 10.

DAWSON TURNER.

THE ROYAL SOCIETY SELECTED CANDIDATES.

THE following are the names and qualifications of the fifteen candidates selected by the Council of the Royal Society, to be recommended for election into the Society this year:—

ROBERT BELL,

M.D., B.A.Sc., LL.D. Assistant Director of the Geological Survey of Canada. Has been actively engaged in the field work of the Survey for thirty-six years. Was concurrently Professor of Chemistry and Geology, Queen's University, Kingston, for five sessions, 1863-68; Naturalist and Medical Officer on the Government Expeditions to Hudson Bay, 1884-85; Royal Commissioner on the Mineral Resources of Ontario, 1888. Distinguished for his services to Canadian Geology, having worked over large sections of the Dominion east of the Rocky Mountains. Has made extensive researches among the Laurentian and Huronian Rocks, and in reference to Glacial phenomena. Has added materially to our knowledge of Zoology and Botany—more especially of the Forestry—of Canada. Has published nearly 100 reports and papers of a scientific character. They include upwards of twenty reports, some accompanied by maps of the Geological Survey, between 1857 and 1890, giving the results of geological and topographical surveys and explorations on both sides of Hudson Bay and Straits, along the principal waters between the upper Great Lakes and James Bay, and of those between the Winnipeg Basin and Hudson Bay, the first survey of Lake Nipigon, geological surveys of the Canadian Sudbury Mining Districts, the Gaspé District, the Lake Peninsula of Ontario, and in other parts of the extensive regions of Canada. Although much condensed, these Reports cover about 930 pp. royal 8vo. Among many additional publications may be mentioned "The Causes of the Fertility of the Land in the Canadian N.W. Territories," "The Petroleum Field of Ontario," "The Huronian System in Canada," "Glacial Phenomena in Canada," "The Geology of Ontario, with special reference to Economic Minerals," "The Laurentian and Huronian Systems North of Lake Huron," "The Origin of Gneiss," "The Forests of Canada," "The Forest Fires in Northern Canada."

Supplementary Certificate.—Since the date of the above certificate Mr. Bell has made further geological investigations of importance north of Lake Huron, and a survey of a large river previously unknown to geography in the country south-east of James Bay, besides a general geological and topographical exploration of an extensive area in that region. He has now been connected with the Geological Survey of Canada for forty years,

and has published 135 scientific papers, reports, &c., besides abstracts of 42 others read by the author. The titles of most of these are published in the *Transactions of the Royal Society of Canada for 1894*.

SIR WILLIAM HENRY BROADBENT,

F.R.C.P. Physician in Ordinary to H.R.H. the Prince of Wales. Consulting Physician to St. Mary's Hospital, and to the London Fever Hospital. Late Lecturer on Medicine, St. Mary's Hospital. Late Senior-Censor of the Royal College of Physicians. Late President of the Harveian, Clinical, and Neurological Societies. Late Examiner in Medicine, University of Cambridge, University of London, and at the Royal College of Physicians of London. Is very eminently distinguished as a physician, and is the author of numerous important Memoirs bearing upon the Physiology and Pathology of the Nervous System and the Heart; and also upon scientific principles of Therapeutics. The following are some of his principal contributions:—"The Sensory Motor Ganglia and Association of Nerve Nuclei" (*Brit. and For. Med. Chir. Rev.*, 1866); "On the Structure of the Cerebral Hemispheres" (*Proc. Roy. Soc.*, 1869); "On the Cerebral Mechanism of Speech and Thought" (*Trans. Med. Chir. Soc.*, 1872); "An Attempt to apply Chemical Principles in Explanation of the Action of Remedies and Poisons" (London, 1869); a work "On the Pulse" (London, 1890); Lettsomian Lectures, before the Medical Society, on "Syphilitic Diseases of the Nervous System," 1874; Harveian Lectures, before the Harveian Society, on "Prognosis in Valvular Disease of the Heart," 1884; Croonian Lectures, before the Royal College of Physicians, on "The Pulse," 1887; Lumleian Lectures, before the Royal College of Physicians, on "Structural Diseases of the Heart," 1891. Numerous other papers have been published in the Medical Journals and Transactions of the Medical Societies.

CHARLES CHREE,

D.Sc., M.A. (Cantab.). Superintendent of the Kew Observatory. Author of the following Memoirs, and many others on analogous subjects:—(1) "Effects of Pressure on the Magnetisation of Cobalt" (*Phil. Trans.*, 1890); (2) "Stresses and Strains in Isotropic Elastic Solid Ellipsoids," &c. (*Proc. Roy. Soc.*, 1895); (3) "Conduction of Heat in Liquids" (*ibid.*, 1887); (4) "A Solution of the Equations for Equilibrium of Elastic Solids," &c. (*Camb. Phil. Trans.*, vol. xv.); (5) "On some Compound Vibrating Systems" (*ibid.*, vol. xv.); (6) "Changes in Dimensions of Solids due to given Systems of Forces" (*ibid.*, vol. xv.); (7) "The Isotropic Elastic Sphere and Spherical Shell" (*Camb. Phil. Trans.*, vol. xv.); (8) "Forced Vibrations in Isotropic Elastic Solid Spheres and Spherical Shells" (*ibid.*, vol. xvi.); (9) "Rotating Elastic Solid Cylinders of Elliptic Section" (*Phil. Mag.*, 1892); (10) "Contributions to the Theory of the Robinson Cup Anemometer" (*Phil. Mag.*, 1895); (11) "Longitudinal Vibrations of Acetotropic Bars with One Axis of Material Symmetry" (*Quart. Journ. Math.*, 1890); (12) "Isotropic Elastic Solids of nearly Spherical Form" (*Amer. Journ. Math.*, vol. xvi.).

HENRY JOHN ELWES,

F.L.S., F.Z.S. President of the Entomological Society (1893-94). Vice-President of the Horticultural Society (1878-80). Late Captain, Scots Fusilier Guards. Has for many years devoted himself to the study of Ornithology and Entomology, and has travelled extensively with the view of investigating the migrations, variations, and geographical distribution of birds and certain classes of insects over large areas of the northern hemisphere. In pursuance of his researches he has visited India on four occasions (1870, 1876, 1880, 1886), extending his observations from Travancore to the Punjab, Assam and the loftiest Himalaya bordering on Tibet; the Eastern and Western United States, Canada, and Mexico (1888, 1893); Greece, Turkey, Asia Minor, and the Crimea (1869, 1874); Algeria (1882); and all parts of Europe. His collections and observations have yielded very important results, notably his paper "On the Geographical Distribution of Asiatic Birds" (*Proc. Zool. Soc.*, 1873), wherein the Himalayan and Chinese Avi-faunas are shown to be one. Other papers are: "On the Ornithology of the Cardamum Hills, Travancore" (*Ibis*, 1870); "On the Genus *Parnassius*" (*Proc. Zool. Soc.*, 1886); "On *Hemicurys*" (*Ibis*, 1872); "On the Papilionidae of the Eastern Alps" (*Entom. Monthly Mag.*, 1880); and of

"The Sikkim Himalaya" (*Proc. Zool. Soc.*, 1882); and of "Amur-land, N. China and Japan" (*loc. cit.*, 1881); and of the "Naga and Karen Hills" (*loc. cit.*, 1891-92). Mr. Elwes is author of a valuable memoir on the genus *Lilium*, and has, during his travels, communicated many interesting plants to the Royal Gardens, Kew.

JOHN SCOTT HALDANE,

M.D., M.A., M.R.C.P. (Edin.). Hon. M.A., Oxford. Lecturer in Physiology, University of Oxford. Author of the following and of other Memoirs:—"The Elimination of Aromatic Bodies in Fever" (*Journ. Physiol.*, vol. ix., 1888); "The Carbonic Acid, Organic Matter, and Micro-organisms in Air" (with Prof. Carnelley and Dr. Anderson), (*Phil. Trans.*, 1887); "The Air of Sewers" (with Prof. Carnelley), (*Proc. Roy. Soc.*, 1887); "The Air of Buildings and Sewers" (*Trans. Sanit. Inst.*, 1887); "The Accurate Determination of the Carbonic Acid and Moisture in Air" (with Mr. Pembrey), (*Phil. Mag.*, 1890); "A New Form of Apparatus for Measuring the Respiratory Exchange" (*Journ. Physiol.*, vol. xix., 1892); "The Physiological Effects of Air vitiated by Respiration" (with Mr. Lorrain Smith), (*Journ. of Pathol. and Bacteriol.*, 1892); "The Toxic Action of Expired Air" (with Mr. Smith), (*ibid.*, 1893); "An Improved Form of Animal Calorimeter" (with Drs. Hale White and Washbourn), (*Journ. Physiol.*, vol. xvi., 1894); "On Red Blood Corpuscles of Different Specific Oxygen Capacities" (with Mr. Smith), (*ibid.*, vol. xvi., 1894); "The Nature and Physiological Action of Black Damp" (*Proc. Roy. Soc.*, vol. lvii.); "Investigations on Composition, Occurrence, and Properties of Black Damp" (with Mr. W. N. Atkinson), (*Trans. Fed. Inst. Mining Eng.*, 1895); "The Relation of Carbonic Oxide to Oxygen Tension" (*Journ. Physiol.*, vol. xviii., 1889).

Supplementary Certificate.—Report to the Home Secretary on the Causes of Death in Colliery Explosions, 1896 (Parliamentary Paper); "The Nature and Sources of the Suffocation Gas met with in Wells" (*Trans. Fed. Inst. Mining Engineers*, vol. xi., p. 265); "Oxygen Fusion of Arterial Blood" (with Prof. Lorrain Smith), (*Journ. Physiol.*, in the Press).

WILLIAM A. HASWELL,

M.A., D.Sc. (Edin.). F.L.S. Vice-President Linnean Society of New South Wales. Trustee of the Australian Museum. Corr. Memb. Royal Society of Tasmania. Memb. K. Leopold.-Carol. Deutsche Akad., Halle. Challis Professor of Zoology, University of Sydney, N.S.W. Distinguished as a zoologist and comparative anatomist. Author of seventy-four papers, mainly morphological, including the following:—"Catalogue of the Australian Stalk and Sessile-eyed Crustacea," 1882; "On *Tenniocephala*, an aberrant Monogenetic Trematode" (*Quart. Journ. Micros. Sci.*, 1888); "A Monograph of *Tenniocephaleæ*" (Macleay Memorial Volume, 1892); "A Monograph of the Australian Aphroditeæ" (*Proc. Linn. Soc. N.S.W.*, 1882); "The Marine Annelides of the Order Serpulea" (*ibid.*, 1884); "On the Structure of the so-called Glandular Ventricle of Syllis" (*Quart. Journ. Micros. Sci.*, 1886); "On an apparently New Type of *Platyhelminthis*" (Macleay Memorial Volume, 1892); "A Revision of the Australian *Lemodipoda*" (*Proc. Linn. Soc. N.S.W.*, 1884); "A Revision of the Australian Isopoda" (*ibid.*); "Studies on the Elasmobranch Skeleton" (*ibid.*); "On the Structure of the Paired Fins of *Ceratodus*, &c." (*ibid.*, 1882); "Observations on the Early Stages in the Development of the Emu" (*ibid.*, 1887); "On *Polycercus*, a Proliferating Cistode Parasite of the Earthworms" (*ibid.*, 1893); "A Comparative Study of Striated Muscle" (*Quart. Journ. Micros. Sci.*, vol. xxx.), in conjunction with Mr. J. P. Hill.

GEORGE BOND HOWES,

F.L.S., F.Z.S., Assistant Professor of Zoology in the Royal College of Science, London. Member of Council of the Linnean Society, and of the Anatomical Society. Examiner in Zoology, Victoria University, and for the University of New Zealand. Author of an "Atlas of Elementary Biology," and joint co-author of the revised and extended edition of "Huxley and Martin's Practical Biology." Author of numerous papers on Morphology, dealing especially with the Ichthyopsida and Mammalia, of which the following are the more important:—"On some points in the Anatomy of the Porpoise" (*Journ. Anat. and Phys.*, vol. xiv. p. 467); "Notes on the Cranio-Facial

Skeleton of the Sturgeon" (incorporated in Prof. W. K. Parker's monograph in *Phil. Trans.*, 1882, p. 171); "The Morphology of the Mammalian Coracoid" (*Journ. Anat. and Phys.*, vol. xxi. p. 190); "On the Skeleton and Affinities of the Paired Fins of Ceratodus and those of the Elasmobranchii" (*Proc. Zool. Soc.*, 1887, p. 3); "On a hitherto Unrecognised Feature in the Larynx of the Anurous Amphibia" (*ibid.*, p. 491); "Rabbit with an Intra-Narial Epiglottis, with a suggestion concerning the Phylogeny of the Mammalian Respiratory Apparatus" (*Journ. Anat. and Phys.*, vol. xxiii. p. 263); "Additional Observations upon Intra-Narial Epiglottis" (*ibid.*, p. 587); "Variation in the Kidney of *Raia clavata*: its Nature, Range, and probable Significance" (*ibid.*, vol. xxiv. p. 407); "On the Visceral Anatomy of the Australia Torpedo" (*ibid.*, p. 669); "Observations on the Pectoral Fin-Skeleton of Living Batoid Fishes, and of the Extinct Genus *Squaloraja*," &c. (*ibid.*, p. 675); "On some Hermaphrodite Genitalia in *Gadus Morrhua*," &c. (*Journ. Linn. Soc. Zoology*, vol. xxiii. p. 539); "On the Probable Existence of a Jacobson's Organ among the Crocodilia; with Observations upon the Skeleton of that organ in the Mammalia," &c. (*Proc. Zool. Soc.*, 1891, p. 148); "Notes on the Shoulder-Girdle of certain Diconodont Reptiles" (*ibid.*, vol. xxvi. p. 403); "On the Affinities, Intra-relationships, and Systematic Position of the Marsipobranchiata" *Trans. Liverpool Biol. Soc.*, vol. vi. p. 122, &c.

Supplementary Certificate.—Professor of Zoology, Royal College of Science, Treasurer Anatomical Society of Great Britain, and President of the Malacological Society of London; Zoological Secretary of the Linnean Society; Memb. Council Zoological Society. Has continued work on "The Morphology of Coracoid of Terrestrial Vertebrata" (*Proc. Zool. Soc.*, 1893, p. 385), and published papers dealing, among other subjects, with:—"Morphology of Pelvic Girdle of Mammalia" (*Journ. Anat. Phys.*, vol. xxvii. p. 543); "Variation and Development of the Vertebral and Limb-Skeleton of Amphibia" (*Proc. Zool. Soc.*, 1893, p. 268); "Synostosis and Curvature of the Spine in Fishes" (*ibid.*, 1894, p. 95); "Types of Modification of Mammalian Hyoid" (*Journ. Anat. Phys.*, vol. xxx. p. 513). Has edited and annotated English translation of Wiedersheim's "Rau des Menschen."

F. STANLEY KIPPING,

D.Sc. (Lond.), Ph.D. (Munich). Lecturer and Chief Assistant in the Chemical Department of the City and Guilds of London Institute, Central Technical College. Distinguished as an original and very skilful and persistent worker in Chemistry. Author of sixteen papers published in the *Transactions of the Chemical Society*, and of others in the *Journal of the German Chemical Society*, the following being the titles of several of these:—"The Synthetical Formation of Closed Carbon Chains in the Aromatic Series"; "Action of Phosphoric Anhydride on Fatty Acids" (3 parts); "Hydrindone and its Derivatives"; "Formation of the Hydrocarbon Truxene"; (in conjunction with Dr. Perkin) "Diacylpentane and Dibenzoylpentane"; "Derivatives of Phenylhexamethylene"; "Synthesis of Dimethylhydroxy heptamethylene," &c.; (in conjunction with Dr. Armstrong) "The Formation of Ketones from Camphor"; (in conjunction with Mr. Pope) "Sulphonic Derivatives of Camphor."

GEORGE BALLARD MATHEWS,

M.A., Professor of Mathematics in the University College of North Wales. Late Fellow of St. John's College, Cambridge; Fellow of University College, London. Eminent Mathematician. Author of the following works of merit in connection with Mathematics:—"Theory of Numbers" (1892); "Complex Multiplication Moduli of Elliptic Functions for the Determinants -53 and -61" (*Proc. Lond. Math. Soc.*, vol. xxi.); "On Class Invariants" (*ibid.*, vol. xxi.); "Note on Dirichlet's Formula for the Number of Classes of Binary Quadratic Forms for a Complex Determinant" (*ibid.*, vol. xxiii.); "On Binary Quadratic Forms with Complex Coefficients" (*Quart. Journ. Math.*, vol. xxv.); "On the Classification of Symmetric Functions" (*ibid.*); "On the Expansion of the Coordinates of a Point upon a Tortuous Curve in terms of the Arc" (*ibid.*, vol. xxvi.); "Irregular Determinants and Sub-triplicate Forms" (*Mess. Math.*, vol. xx.); and others, a list of which is sent.

GEORGE ROBERT MILNE MURRAY,

F.L.S., F.R.S.E. Assistant (First Class), Department of Botany, British Museum. Naturalist to the Solar Eclipse Ex-

pedition to Grenada, 1886. Examiner in Botany, Glasgow University, 1887-92; Victoria University, 1889-92. Lecturer on Botany at the Royal Veterinary College, London. Author of numerous papers on the structure, classification, and distribution of Cryptogams, of which the following are the more important:—"Investigations into the Infection of Fishes with *Saprolegnia ferax*" (*Reports of the Inspector of Fisheries*, 1883-85); "On the Outer Peridium of *Broomeia*" (*Journ. Linn. Soc.*, 1882); "On two New Species of *Lentinus*, one of them growing on a large Sclerotium" (*Journ. Linn. Soc.*, 1886); "On a New Species of *Rhipilia*" (*ibid.*); "On *Boodlea*, a New Genus of *Siphonocladacea*" (*Journ. Linn. Soc.*, 1890); The Distribution of Marine Algae in Space and Time" (*Trans. Biol. Soc., Liverpool*, 1891); "On a Fossil Alga belonging to the Genus *Caulerpa*, from the Oolite" (*Phycological Memoirs*, 1892); "On a New Species of *Caulerpa*, with Observations on the Position of the Genus" (*Trans. Linn. Soc.*, 1891); "On the Structure of *Dictyosphaeria*" (*Phycological Memoirs*, 1892); "A Comparison of the Marine Floras of the warm Atlantic, the Cape of Good Hope, and the Indian Ocean" (*ibid.*); "On *Halicystis* and *Valonia*" (*ibid.*). Author of several articles in the "Encyclopaedia Britannica," including "Fungi" and "Vegetable Parasitism." Joint author, with Mr. A. W. Bennett, M.A., of "A Handbook of Cryptogamic Botany," 1889; with Mr. Boodle, of Memoirs on "The Structure of *Spongocladia*" (*Annals of Botany*, 1888); "A Structural and Systematic Account of *Struvea*" (*ibid.*); "A Systematic and Structural Account of *Avrainvillaea*" (*Journ. Bot.*, 1889); and, with Miss Barton, "The Structure and Systematic Position of *Chauvinsia*" (*Linn. Soc.*, 1891).

Supplementary Certificate.—Keeper of Botany, British Museum (Natural History). Author of "A Comparison of the Arctic and Antarctic Marine Floras" (with Miss Barton) (*Phycological Memoirs*, part iii.); "A New Part of *Pachytheca*" (*ibid.*); "On the Reproduction of some Marine Diatoms" (*Proc. Roy. Soc. Edin.*, 1897); "Introduction to the Study of Seaweeds," 1895.

FRANCIS HENRY NEVILLE,

M.A., College Lecturer. Fellow and Lecturer in Natural Science, Sidney College. Fifteenth Wrangler, 1871. Author of "Recent Progress in the Study of Alloys" (*Science Progress*, vol. iv. Nos. 20, 21); joint author with Mr. C. T. Heycock of the following:—"On a Simplified Form of Apparatus for Determining the Density of Ozone" (*Proc. Camb. Phil. Soc.*, vol. v.); "Lowering of the Freezing Point of Tin by the Addition of other Metals" (*Proc. Chem. Soc.*, No. 65, 1889); "Lowering of the Freezing Point of Sodium by the Addition of other Metals" (*Trans. Chem. Soc.*, vol. lv., 1889); "Molecular Weights of Metals when in Solution" (*ibid.*, vol. lvii.); "Freezing Point of Triple Alloys of Gold, Cadmium, and Tin" (*ibid.*, vol. lix.); "Lowering of the Freezing Points of Cadmium, Bismuth, and Lead, when alloyed with other Metals" (*ibid.*, vol. lxi.); "Isolation of a Compound of Gold and Cadmium" (*ibid.*); "Freezing Point of Alloys, in which Thallium is the Solvent" (*ibid.*, 1894); "Freezing Point of Triple Alloys" (*ibid.*); "On the Determination of High Temperatures by means of the Platinum Resistance Pyrometers" (*ibid.*, 1895).

H. ALLEYNE NICHOLSON,

M.D. (Edin.), D.Sc., Ph.D., F.G.S. Regius Professor of Natural History in the University of Aberdeen. Swiney Lecturer on Geology in the British Museum, 1877-81, 1890-94. Formerly Professor of Natural History in the University of Toronto, 1871-74; afterwards in the University of St. Andrews, 1875-82. Has devoted himself specially to the study of Palaeontology. The following are the titles of some of the more important of his numerous published contributions:—"Manual of Palaeontology" (third edition); "Invertebrata," 1889; "Monograph of the British Stromatopora," 4to, 234 pp., 28 plates, 1885-92; "The British Graptolites," 1872; "The Palaeozoic Tabulate Corals," 1879; "On Monticulipora and its Subgenera," 1881; "Reports on Palaeontology of the Province of Ontario," 1874-75; "Silurian Fossils of Girvan," 1881 (jointly with R. Etheridge, jun.); "Bibliography of N. American Invertebrate Palaeontology" (with Prof. C. A. White), 1878; "Report on Silurian and Devonian Fossils of State of Ohio," 1875. He has also published numerous separate memoirs on the Graptolites, the Stromatopora, the Palaeozoic Corals, the Monticuliporoids, the Palaeozoic Polyzoa, and certain obscure

organisms which contribute largely to form some palaeozoic limestones. He has likewise contributed largely to our knowledge of the structure and fossils of the palaeozoic rocks of the Lake District of the North of England by his "Essay on the Geology of Cumberland and Westmoreland," 1868; "On the Strata and their Fossil Contents between the Borrowdale Series and the Conistone Flags" (*Quart. Journ. Geol. Soc.*, 1867), jointly with Prof. Harkness; "Additional Observations on the Geology of the Lake District" (*ibid.*, 1866); "Relations between the Skiddaw Slates and the Green Slates and Porphyries of the Lake District" (*Geol. Mag.*, 1869); "On the Lower Portion of the Green Slates and Porphyries of the Lake District" (*Quart. Journ. Geol. Soc.*, 1871); "On the Occurrence of a New Fossiliferous Horizon in the Ordovician Rocks of the Lake District" (*Geol. Mag.*, 1888, conjointly with J. E. Marr); "On the Stockdale Series of the Lake District" (*Quart. Journ. Geol. Soc.*, 1888, conjointly with J. E. Marr); "On the Cross Fell Inlier" (*ibid.*, 1891, jointly with J. E. Marr). Prof. Nicholson was awarded the Lyell Medal by the Council of the Geological Society in 1888, "as a mark of appreciation of his valuable researches among the older palaeozoic rocks, both in the Old and the New World, and of his continued and patient investigations into the organisation of some of those obscure forms of life which abounded at the period of the deposition of those rocks" . . . "his researches have given him a high place among Palaeontologists," whilst as a teacher and lecturer he is most successful.

JOHN MILLAR THOMSON,

F.R.S.E., F.I.C. Secretary of the Chemical Society. Professor of Chemistry and Lecturer on Photography, King's College. Professor of Chemistry, Queen's College, London. Author of the following original papers:—"The Composition and Properties of Ancient Glass from Tombs in Cyprus" (*Proc. Phil. Soc.*, Glasgow, 1870); "The Composition of certain Double Salts of Nickel and Cobalt in their relation to Dichroism" (*Brit. Assoc. Rept.*, 1877); "Action of Isomorphous Salts on Supersaturated Solutions of other Salts" (*Journ. Chem. Soc.*, 1879); "Action of Constituent Salts on Supersaturated Solutions of Double Salts and Mixtures" (*ibid.*, 1882). Author of the following published lectures and papers:—"The Position of Chemistry in a Technical Education" (*Journ. Soc. of Arts*, 1878); "Solution and Crystallisation" (Glasgow Science Lecture Association, 1879); "The Composition and Properties of certain Pigments" (Cantor Lectures, *Journ. Soc. of Arts*, 1885); "Suspended Crystallisation" (*Proc. Roy. Inst.*, 1886); "The Chemistry of Putrefaction and Antiseptics" (Cantor Lectures, *Journ. Soc. of Arts*, 1887). Distinguished as a lecturer and teacher in Chemistry.

FREDERICK THOMAS TROUTON,

Sc.D. (Dubl.), M.A. Assistant to Erasmus Smith's Professor of Natural Philosophy in the University of Dublin. Teacher of Experimental Physics. Discovered the law connecting the latent heat of vapourisation and molecular weights of bodies known as "Trouton's law" and experimentally determined the directions of vibration of electric and magnetic force in plane polarised light. He has made other important observations on the phase of secondary waves and on the influence of the size of the reflector in Hertz's experiment. Author of:—"On Molecular Latent Heat" (*Phil. Mag.*, vol. xviii.); "Repetition of Hertz's Experiments and Determination of the Direction of the Vibrations of Light" (*NATURE*, vol. xxxix.); "Experiments on Electromagnetic Radiation, including some on the Phase of Secondary Waves" (*NATURE*, vol. xl.); "Multiple Resonance obtained with Hertz's vibrations" (*NATURE*, vol. xli.); "On the Acceleration of Secondary Electromagnetic Waves" (*Phil. Mag.*, vol. xxix.); "The Influence of the Size of Reflector in Hertz's Experiment" (*Phil. Mag.*, vol. xxxii.); "Some Experiments to Determine Wave Velocity in certain Dielectrics" (*Rept. Brit. Assoc.*, 1890); "On Thermo-Electric Currents in Single Conductors" (*Proc. Roy. Dublin Soc.*, 1886); "On Temporary Thermo-currents in Iron" (*Rept. Brit. Assoc.*, 1889); "On the Motion under Gravity of Fluid Bubbles through Vertical Columns of Liquid of a Different Density" (*Proc. Roy. Soc.*, vol. liv.); "On the Motion of a Body near Points of Unstable Equilibrium and on the same when capable of Internal Vibration" (*Proc. Roy. Dublin Soc.*, 1888); "On a convenient Method of obtaining any required Electrical Potential for Use in Laboratory Teaching" (*ibid.*); "On the Control Supply Pipes

have on Reeds" (*ibid.*); "A Coefficient of Abrasion as an Absolute Standard of Hardness" (*Rept. Brit. Assoc.*, 1880); "On the Use of a Permanently Magnetised Core in a Telephone" (*Phil. Mag.*, vol. xxxiv.); "On Ohm's Law in Electrolytes" (*Rept. Brit. Assoc.*, 1887-88), jointly with Prof. Fitzgerald; "A Method of Determining the Specific Induction Capacity of Dielectrics" (*Phil. Mag.*, vol. xxxiii.), jointly with Mr. W. E. Lilly.

HERBERT HALL TURNER,

M.A., B.Sc. Formerly Fellow of Trinity College, Cambridge. Savilian Professor of Astronomy, Oxford. Secretary to the Royal Astronomical Society. Late Chief Assistant at the Royal Observatory, Greenwich, 1884-94. Author of various papers, among which may be mentioned: "On the Correction of the Equilibrium Theory of Tides for the Continents" (with Prof. G. H. Darwin) (*Proc. Roy. Soc.*, vol. i.); "Report of Observations of the Total Solar Eclipse of August 29, 1886" (*Phil. Trans.*); "On Mr. Edgeworth's Method of Reducing Observations relating to Several Quantities" (*Phil. Mag.*, vol. xxiv.); "On Mr. Marth's Intersects" (*Monthly Notices*, vol. xli.); "Observations for Coincidence of Collimator at Royal Observatory, Greenwich" (*ibid.*, vols. xli. and liii.); "On the Variations of Level and Azimuth of the Transit Circle at Royal Observatory, Greenwich" (*ibid.*, vol. xlii.); "On the Longitude of Paris" (*ibid.*, vol. li.); "On Stellar Photography" (*ibid.*, vols. xlix. and li.); "On the R.-D. Discordance" (*ibid.*, vols. liii, liv., and *Memoirs Roy. Astron. Soc.*, vol. li.); "On New Forms of Levels" (*Monthly Notices*, vol. lii.); "Comparison of the Cape (1880) and Greenwich (1880) Star Catalogues" (*Memoirs Roy. Astron. Soc.*, vol. li.); "On the Reduction of Measures of Photographic Plates" (*Monthly Notices*, vol. liv.).

EDWARD JAMES STONE, F.R.S.

THE distinguished astronomer, whose name stands at the head of this notice, and whose loss will be regretted in many scientific circles, played a very prominent part in the history of astronomy during the last forty years. Although he took an active, and often a foremost, place in all the astronomical problems that have aroused attention during this period, he was more conspicuously attached to the astronomy of position, and it was by his devotion to meridian observations that his reputation was mainly won. The early training which he received under Airy, at Greenwich, whither he went on leaving Cambridge in 1860, contributed to this choice. At that time the results obtainable by photography and spectroscopy were quite undeveloped, and the lines on which the Greenwich Observatory then worked were such as to ensure a devotion to accuracy, and the appreciation of the value of star catalogues. All who have since had occasion to use the star places which Mr. Stone published, whether from the Cape, or from the Radcliffe Observatory, have reason to be grateful for that training, which, resulting in his adherence to the methods that he early acquired, led to the production of such admirable work.

In connection with his meridian observations, Mr. Stone had, from time to time, published memoirs on the value of the constants of nutation and refraction, which, though they have not displaced the values assigned by other astronomers, have yet testified to his industry and illustrated his power of conducting a searching discussion into large masses of observations, possessing varying degrees of accuracy. He also largely identified himself with inquiries into the proper motions of stars, the systematic differences between stellar catalogues, the motion of the solar system in space—all questions which demand long numerical calculations, and the values of whose final results depend upon the maintenance of rigorous accuracy in the computations.

In striving to estimate the loss to science caused by the death of the Radcliffe Observer, we give prominence to his meridian work. We recognise the fact that the old

school of astronomy has lost an exponent whom it is not easy to replace. But it would be an injustice to his memory to forget that he showed at times considerable power of originality. His work on such questions as that of the Solar Parallax is deservedly well appreciated. Thirty years ago the problem of the sun's distance occupied a very different position to what it does now. Encke's value, obtained from the discussion of the Transits of Venus of 1761 and 1769, long used without question or hesitation, was beginning to lose its authority before the tests of more rigorous analysis, and the adoption of methods better suited for the determination of this fundamental constant. Stone, by his investigation of the observation of Mars in the opposition of 1862, contributed in no small measure to increase the suspicion which was hovering around the old value of 8"·58. With his attention drawn to this subject, he next reviewed the evidence on which this value was based. With better knowledge of the longitudes of the observing stations, and with possibly a more judicious interpretation of the observer's remarks, he was able to give not only greater accordance to the various observations, but to obtain a result more nearly equal to that derived from other sources of information. For this work he was awarded the gold medal of the Royal Astronomical Society, the President contending that Mr. Stone had shown, beyond all doubt, "that the method pursued by his illustrious countryman Halley, when fairly treated, is capable of furnishing a value of the Solar Parallax commensurate in precision with the expectations formed of it." The history of subsequent transits has, perhaps, not borne out this favourable view, expressed in 1869; but Stone's loyal and persistent efforts to deduce from the transits all that they were capable of giving are shown, by the part he took, both in 1874 and 1882. In the former year he was Her Majesty's astronomer at the Cape of Good Hope, and contributed much to the organisation of the various expeditions to the Southern Hemisphere. By the time of the second transit in 1882, he had succeeded to the direction of the Radcliffe Observatory on the death of the Rev. Robert Main, and there he trained the selected observers in methods suggested by the experience gained in 1874. After the transit, the whole of the observations were reduced under his immediate superintendence, with results too well known to need further mention.

It is needless to say that Mr. Stone's direction of the Radcliffe Observatory during the last twenty years was characterised with vigour and general success. Two important star catalogues were issued under his superintendence. The meteorological department received considerable attention, and Mr. Stone, in addition, accepted a seat at the Board of the Meteorological Council. In another matter, which one naturally wishes to pass over very briefly, his researches were not so successful, but have shown him the victim of a strange paradox. The comparatively large discrepancies which exist between the observed longitudes of the moon and those computed from Hansen's tables, he sought to explain by attributing their origin to the substitution of Le Verrier's tables of the sun for those of Carlini. This slight breach of continuity in the record of mean solar time, produced by the introduction of the newer tables into the Nautical Almanac was, he urged, the cause of the gradual increase in the error of Hansen's tables; and though many eminent authorities, including Profs. Adams and Newcomb, endeavoured to convince him of his error, he supported his views to the last, and regularly published the errors of the lunar tables, as derived from the Radcliffe observations, after applying to the mean time of observation a correction based upon his theory.

On two occasions Mr. Stone observed a total eclipse of the sun; the first at Klipfontein in Namaqualand, and

last summer he accompanied Sir George Baden Powell to Nova Zemlya, where he was again successful in watching the phenomenon. But to the physical side of astronomy he gave little attention; nor is the Radcliffe Observatory equipped in a manner to make such observations possible.

Mr. Stone received many acknowledgments of the value of his work. Besides being a Fellow of the Royal Society, he had been President of the Royal Astronomical, and held other offices in connection with the same Society. He received a Doctor's degree from the University of Padua, and besides the Astronomical Society's medal, to which allusion has been made, the French Academy bestowed upon him the Lalande medal, as a testimony to the value of his Southern Catalogue of 12,500 stars. He died on Sunday, May 9, at his Oxford residence, aged sixty-six.

W. E. P.

NOTES.

THE first of the two annual conversazioni of the Royal Society was held yesterday evening, as we went to press.

THE University of Toronto has decided to confer the degree of LL.D. upon Lord Lister, Lord Kelvin, Lord Rayleigh, and Sir John Evans.

THE fifteen candidates selected on Thursday last by the Council of the Royal Society to be recommended for election into the Society are:—Dr. R. Bell, Sir W. H. Broadbent, Bart., Dr. C. Chree, Mr. H. J. Elwes, Dr. J. S. Haldane, Prof. W. A. Haswell, Prof. G. B. Howes, Dr. F. S. Kipping, Prof. G. B. Mathews, Mr. G. R. Milne Murray, Mr. F. H. Neville, Dr. H. A. Nicholson, Prof. J. M. Thomson, Dr. F. T. Trouton, and Prof. H. H. Turner. Following our usual custom, we print in another part of this issue the certificates of the candidates selected.

DR. C. LE NEVE FOSTER has given men of science cause to be proud that he is one of them. On Saturday morning last he was at the Snaefell lead mine, Isle of Man, in his capacity of Her Majesty's Inspector of Mines. An explosion had occurred there on the preceding Monday, and Dr. Foster's object was to ascertain whether it was possible to recover the body of a miner remaining in the workings. Lighted candles sent down to test the atmosphere burnt brightly at 115 fathoms, but were extinguished at 130 fathoms. From these indications it was considered safe to go down a certain distance; so a party, consisting of Dr. Foster, Mr. G. J. Williams (Assistant Inspector of Mines), Captain Reddcliffe, Captain Kewley, and eight others descended the shaft. The air below was tested, and found to be poisonous; but as the party was only a few feet above the body of the miner, Captain Kewley went two or three steps down a ladder, and attempted to catch the man's clothing with grappling-irons. The commotion caused by his swinging to and fro appears to have disturbed the gas, for Captain Kewley was at once overcome, and had to be hauled back to the landing. He was put into the box, and the box was going up to the surface, when it became jammed, and for over an hour could not be moved. Meanwhile, Dr. Foster and those of his companions who could not climb to the surface were below suffering from the influence of the poisonous gas—apparently carbon monoxide. During this time, when death seemed to be very near, Dr. Foster made copious notes of his sensations. He commenced writing at 2 p.m., and continued until 3.30, when he was brought to the surface, he being the last to go up. Some of the men were unconscious when brought to the surface, and others arrived in an excited and hysterical condition. The record obtained by Dr. Foster will be a most valuable physiological document,

for, judging from the extracts given in the daily press, the gas to which the exploring party was subjected has a peculiar effect upon the mind. As the minutes passed by, Dr. Foster's notes became more and more disjointed, and it is hard to believe that he knew exactly what he was writing towards the end. The following are a few of the notes written while he believed himself to be dying:—"I fear we are all dying. No help coming. . . . The box does not come. In spite of all our ringing for help, it will not come. Captain Reddicliffe is struggling. No real pain. Good-bye. I feel as if I were sleeping. Again, good-bye all! 2.15 p.m.—We are all done. Oh, for the box! It is held in the shaft. . . . It is really like a bad dream. No pain. No pain. For the benefit of others, no pain. . . . 2.25 p.m.—Two of the party are all right. I think they are ringing. When is help coming? The box is gone. Four new men are coming. I don't feel bad. It is strange to write notes while we are dying. What a lot I have written! Captain Reddicliffe is about the worst. I think he will go first. While there is life there is hope. Good old proverb! Send a note for more brandy. Send for more help. The box has just gone up with Reddicliffe. Williams goes next—he has a capital heart. 2.45.—I have written pages. Kewley is a good fellow. There is life in the old horse yet. I feel as if I could sing. God is helping us; he has heard our prayer. My turn to go." Arriving at the surface, and getting out of the box, Dr. Foster, note-book in hand, though weak and staggering, made the entry stating the time at which he got to the top. His last entry was:—"Dr. Miller says I must be quiet, but I won't." The pathetic side of this record, made by one who had almost crossed the dark valley, but was happily brought back to tell his tale, touches all of us. We admire Dr. Foster for his coolness in time of danger, and for remaining behind until all his party had been rescued. The world could ill spare a man with such sterling qualities, and science would grieve to lose an investigator who devoted what seemed to be his last moments to extending knowledge "for the benefit of others." We offer to Dr. Foster our heartiest congratulations upon his rescue, and we trust that he may never again have to repeat his terrible experience.

THE next annual meeting of the Australasian Association for the Advancement of Science will commence on January 6, 1898.

M. SOUILLART, Professor of Astronomy in the University of Lille, has been elected a Correspondant in the Section d'Astronomie of the Paris Academy of Sciences, in succession to the late Prof. Gylden.

A REUTER correspondent at St. Petersburg states, on the authority of the *Novoe Vremya*, that an expedition is to be sent by the Russian Geographical Society and Academy of Sciences to study the geography and natural history of the Khanates of Roshan, Shignan, and Darwaz.

WE learn from *Science* that Miss Alice Bache Gould has given \$20,000 to the National Academy of Sciences as a memorial to her father, the distinguished astronomer, Dr. B. A. Gould. It will be known as the Gould Fund, and the income will be used to promote researches in mathematics and astronomy.

A COMPLIMENTARY banquet will be given to Lord Lister at the Café Royal, Regent Street, on May 26, by his former house-surgeons, clerks, and dressers. A complete list is being prepared of those who have been closely associated with Lord Lister in his teaching career, which extends over a period of thirty-two years—from 1861 to 1893.

THE vehicles entered for the *Engineer* 1100 guineas road carriage competition will be examined by the judges on Friday

and Saturday, May 28 and 29, at the Crystal Palace. The long-distance run, between the Crystal Palace and Post Office in Birmingham, will begin on Tuesday, June 1. The distance over the whole course, upon which the time allowance referred to in the conditions will be computed, has been fixed by the judges at 263 miles.

THE Prussian Academy of Sciences have made a grant of 1100 marks to Prof. Dr. Paschen, Hanover, for the study of the energy in the spectra of dark bodies; and of 1000 marks to Dr. N. Herz, now at Heidelberg, for the reduction of observations made at the Kuffner Observatory, Vienna. Dr. O. Bütschli, Heidelberg, and Dr. A. Weismann, Freiburg, have been elected corresponding members of the Academy.

THE Engineering Conference, organised by the Institution of Civil Engineers, will be opened at 10.30 a.m. on Tuesday, May 25, in the large hall of the Westminster Town Hall, when the President, Mr. J. Wolfe Barry, C.B., F.R.S., will deliver a short address to the combined Sections. The several Sections will then proceed to the consideration of their respective business in the Town Hall and the Guildhall. The meetings will be continued on the 26th and 27th, at the same places, at 10.30 each day.

MR. ROBERT C. L. PERKINS, B.A. of Jesus College, Oxford, who has been for several years engaged on behalf of the Joint Committee appointed by the Royal Society and the British Association for investigating the zoology of the Sandwich Islands, has now returned to England, and, we rejoice to say, is in good health, notwithstanding all the hardships he has undergone. A very instructive paper by him, on "The Introduction of Beneficial Insects into the Hawaiian Islands," will be found in *NATURE* of March 25 last (p. 499).

THE summer meeting of the Anatomical Society of Great Britain and Ireland will be held this year in Dublin, on June 9, 10, and 11. A very large number of members have promised to attend, and the meeting will be remarkable on account of the numerous distinguished continental anatomists who are expected to take part in the proceedings. Amongst these are Prof. His, Leipzig; Prof. Waldeyer, Berlin; Prof. Stieda, Königsberg; Prof. Spalteholz, Leipzig; Prof. Disse, Marburg; Prof. Klaatsch, Heidelberg; Dr. Otis, Boston; Prof. Leboucq, Ghent; Prof. van der Stricht, Ghent; Prof. van Gehuchten, Louvain; Prof. Retzius, Stockholm; Dr. Kaestner, Leipzig; Dr. de Bruyne, Ghent; and Dr. Fröhse, Berlin. One of the features of the meeting will be an address to be delivered by Prof. His in the new theatre of the Royal Dublin Society, under the auspices of the Royal Academy of Medicine in Ireland. The subject which he has chosen for this address is the "Development of the Brain, Cord and their Nerves." The ordinary meetings of the Society will be held in the Anatomy School of Trinity College.

MR. LAWRENCE BRUNER, of the University of Nebraska, has (says the *American Naturalist*) sailed to Argentina to study the ravages of the locusts, which have recently developed into a terrible pest, certain regions being completely devastated by them. The Argentine Government has granted 400,000 dols. for relief, and a syndicate of business men have raised funds to employ Mr. Bruner to investigate the entomological aspects of the subject.

WE regret to have to include in this week's obituary the names of Prof. Legrand des Cloizeaux, member of the Paris Academy of Sciences, and distinguished for his works on crystallography and the optical properties of minerals; Dr.

H. V. Carter, for many years professor of anatomy and physiology in the Grant Medical College at Bombay; Mr. Walter Rivington, author of a large number of papers on anatomical and surgical subjects, and Fellow of the University of London; Dr. Traill Green, formerly professor of chemistry at Lafayette College; Dr. E. Russow, formerly professor of botany at Dorpat; Dr. Ch. Scholz, professor of geodesy in the Polytechnikum at Delft; and Dr. Traill Green, one of the few surviving founders of the American Association for the Advancement of Science, first president of the American Academy of Medicine, and author of the "Floral and Zoological Distribution of the United States."

At the Royal Institution, on Tuesday, May 25, Dr. Ernest H. Starling will begin a course of three lectures on "The Heart and its Work." The evening discourse on Friday, May 21, will be delivered by Lord Kelvin, his subject being "Contact Electricity of Metals." The Friday evening discourse next week (May 28), will be delivered by Prof. H. Moissan (Directeur, Laboratoire de Chimie Minérale à l'École Supérieure de Pharmacie, Membre de l'Académie des Sciences, Paris), who will lecture in French on "The Isolation of Fluorine" (with experiments). On Friday, June 4, Mr. W. H. Preece, C.B., F.R.S., will lecture on "Signalling through Space without Wires"; and on June 11, Mr. William Crookes, F.R.S., will deliver the last of the Friday evening discourses for the year: his subject will be "Diamonds."

THE Board of Agriculture have issued an order which prohibits the importation of dogs into Great Britain from any other country (except Ireland and the Isle of Man) otherwise than in accordance with certain provisions set forth. The order takes effect on September 15, 1897. After that date no dog may be landed in Great Britain from any other country without a licence from the Board of Agriculture, application for which is to be made to the Secretary of the Board. We agree with the *British Medical Journal* that this action of the President of the Board of Agriculture must be regarded as a step in the right direction. Any scheme for the extermination of rabies and its dependent hydrophobia which does not deal with importation of dogs must be incomplete. It is pointed out, however, that if simultaneous action as to the enforcement of muzzling and importation regulations be not taken in Ireland, it is to be feared that the present attempt to exterminate rabies from Great Britain may fail. A general muzzling order and the present importation order should now be made applicable to Great Britain and Ireland; for, without further assurance of freedom from rabies than can now be given, it cannot be regarded as absolutely safe to introduce without restriction dogs from one part of the United Kingdom to another.

THE provisions of the new Dingley Tariff Bill, taxing books, apparatus, and antiquities imported into the United States, raised such a storm of protests from scientific men and institutions of learning, that they appear to have been abandoned; for we learn from *Science* that the Tariff Bill, as amended by the Senate Finance Committee, includes the following additions, among others, to the list of objects which may be imported free of duty: books, maps, music, engravings, photographs, etchings and charts, printed more than twenty years before the date of importation; all hydrographic charts and scientific books devoted to original scientific research, and publications issued for their subscribers by scientific and literary associations, or publications of individuals for gratuitous private circulation, and public documents issued by foreign Governments; books, maps, &c., especially imported, not more than two copies in any one invoice, for the use of any society or institution established solely for religious, philosophical, educational, scientific or literary purposes, or for the encouragement of the fine arts, or for the

use of any college, school or public library, and not for sale; paraffin, philosophical and scientific apparatus for schools, libraries and societies; professional books, implements and instruments, and tools of trade or occupation in the actual possession at the time of persons arriving in the United States.

At the Leathersellers' Hall on Wednesday, May 12, a large company assembled at a conversazione; the Master, Dr. W. H. Perkin, F.R.S., and Wardens receiving the guests. The numerous and varied nature of the exhibits added great interest to the occasion; and not only were scientific discoveries, mostly of recent date, shown, but the industry associated with the name of the Company was well illustrated. Several very interesting objects were also sent from the different branches of the City and Guilds Institute, a creation of the City Companies of which they may well be proud. The following is a brief summary of the exhibits:—Specimens illustrative of the manufacture of coal-tar colouring matters, and their application, Dr. W. H. Perkin. Among Prof. Ayrton's exhibits may be mentioned an ingenious water model illustrating the retardation of signals in a submarine telegraph cable, a mechanical model illustrating the principle of duplex telegraphy, and some instruments employing the magnifying spring devised by Profs. Ayrton and Perry. Prof. Roberts-Austen exhibited an electric furnace in operation, throwing an image of the interior on a screen. A most interesting collection of specimens of artistic bookbindings was exhibited by Mr. H. B. Wheatley. Photography in colours, and various processes of photographic reproduction were largely represented. Sir H. T. Wood exhibited illustrations of the Dansac-Chassagne process of colour photography. The Autotype Company showed various pictures reproduced by their process, and Mr. Ives gave lantern demonstrations of the Kromskop. Other exhibits included specimens from the Leathersellers' tanning and dyeing school; maps, diagrams, &c., made by the boys in Colfe's school, which is under the management of the Company; specimens in illustration of research work now in progress in the chemical department of the Central Technical College, and several others too numerous to mention in this brief summary.

Two young oak-trees were planted on May 11, at Cowthorpe, near Wetherby, to commemorate the celebrated tree which stands there still, but is greatly decayed, and may not endure much longer. The old tree, as every one knows, girths more than fifty feet, and is in that respect probably the largest oak in the world. The young oaks have been raised from acorns taken from the old tree by Mr. John Clayton, of Bradford, in 1893. The late Mr. Montagu, of Ingmanthorpe, approved of this method of perpetuating the memory of the wonderful tree.

PROF. JOHN MILNE, F.R.S., has sent us a list of ninety-three earthquakes observed by him at Shide, Isle of Wight, from June 14, 1896, to March 1897. The Greenwich mean time of each disturbance is given, and the character and intensity of each record is stated.

IN the *Annales de la Société Belge de Microscopie*, M. A. Lemeere records the results of an experiment in establishing a "peripatetic laboratory" for the zoological and botanical students of the University of Brussels during the summer vacation.

WE learn from the *American Naturalist* that President Cleveland had, by proclamation, set apart thirteen new forest reserves in the United States, representing an area of more than 21 million acres. This increases the total reserve forest land in the West to 39 million acres. The new reserves include all the central portion of the Black Hills of South Dakota, the Big Horn Mountain Range in Wyoming, the Jackson Lake country south of the National Park in Wyoming, all the Rocky Mountains of Northern Montana, a valuable forest region in Northern

Idaho, the principal part of the Bitter Root Mountain region in Montana and Idaho, the Cascade Mountains of the Yosemite National Park, the San Jacinto Mountains in Southern California, and the Uintah Mountains in Northern Utah. The selection of these forest lands was made by the Commission appointed by the National Academy of Sciences. Strong opposition has been made to the appropriation by private owners.

"THE FLORENTINE CRICKETS" is the title of an interesting essay in the folk-lore of these insects, by Sophia Beale, in *The Reliquary and Illustrated Archaeologist* (vol. iii., 1897, p. 65). In Florence, at the Festival of the Ascension, "all the inhabitants prance about carrying little cages dangling from their fingers. It is an ancient custom, its origin is as vague as the date of its institution, but all agree that the little beasts, which are imprisoned in the cages, are a species of talisman—an omen for good or evil to the person who possesses them."

THE re arrangement of the Free Public Museums of Liverpool is rapidly progressing under the administration of Dr. H. O. Forbes. He recognises that Anthropology, or rather that portion of it which is now sometimes termed Anthropography, is a branch of Biology, and so he has devoted a gallery to an exposition of the main races of men at the end of the series of galleries allocated to the Vertebrates. The collection forms an instructive introduction to Ethnology, and we hope that he will be able to make it more complete as opportunities present themselves. The Ethnographical collections, which are in another part of the building, are well displayed, and contain many interesting objects. These collections, together with the well-known Archaeological treasures in the Museums, afford a good foundation for Anthropological studies in Liverpool.

THE *Records* of the Geological Survey of India (vol. xxx. part 1) contain the full account of a palæo-botanical discovery which has been made independently and simultaneously in India and in South Africa. The fossil plant-structure long known under the name of *Vertebraria* is now shown to be nothing else than the rhizome of the fern *Glossopteris*, which has given its name to the remarkable flora of the Gondwana-beds of the southern hemisphere. The specimens figured by Mr. R. D. Oldham show the association of leaf and rhizome clearly, as also do those described by M. Zeiller from near Johannesburg.

M. ÉMILE MÜLLER, Professor in the Lycée of Tashkent, sends to the Société de Géographie an extract from an account of an expedition on the Pamirs by Messrs. Olifsen and Filipsen, Danish officers, describing a remarkable tribe of dwarfs discovered in a little-known part of this region. The men of this tribe are invariably of exceedingly small stature, and a similar dwarfish habit extends to the domestic animals; the oxen of this district are about the size of donkeys, donkeys are no bigger than dogs, while goats and sheep are mere miniatures. In the original account published in the Russian journal, *Pravitelstvenni Vestnik*, for January 11/23, the explorers ascribed these anomalies to the exceptional environment and the arrested development due to the great scarcity of food. The tribe in question is entirely savage, badly armed, and wholly occupied in hunting; their religion is a species of fire-worship.

AMONG recent papers dealing with optical theories in general, we would call attention to Herr Paul Glan's interesting series of theoretical investigations on elastic bodies and light, in *Wiedemann's Annalen*, where results are found agreeing remarkably well with those obtained by experiment with Röntgen and ultraviolet rays; to a short paper in the *Berliner Sitzungsberichte*, by Prof. H. Rubens and E. F. Nichols, on the observation of

electric resonance in heat rays of great wave-length; to a lengthy memoir, by Prof. G. Quesneville, on the double elliptic refraction of quartz (Paris, Offices of the *Moniteur Scientifique*, 1896), in which the author criticises MacCullagh's theory; and to Prof. Augusto Righi's two papers in the *Atti dei Lincei*, vi. 6—one on the elliptic polarisation of electromagnetic waves and their ellipsoid of polarisation in selenite, the other dealing with the absorption of electro-magnetic waves.

PROF. G. O. SARS, who has for many years been specially engaged in the study of the various groups of Crustacea, has in preparation a complete account of the Crustacea of Norway, and his work is now in course of publication by the Bergen Museum. All the known Norwegian species will be described, and will be accompanied by carefully drawn figures of all the forms. Parts iii. and iv. of vol. i., containing descriptions and illustrations of members of five families of Isopods, viz. Anthuridae, Gnathiidae, Egidae, Cirolanidae, and Limnoriidae, have just been issued.

SOMEWHAT late in the season we have received from Mr. Murray a new edition of his "Handbook for Travellers in Lower and Upper Egypt," which has been practically re-written and edited by Miss Brodrick, Prof. Sayce, and Captain Lyons, R.E. It has long been known that the late Sir G. Wilkinson's "Guide" was antiquated, and many of his views and conclusions have for some time past been shown to be untrustworthy, notwithstanding their excellence forty or fifty years ago. Mr. Murray's new work is well printed on thin paper, and takes up less room than the earlier editions; we venture to think that a "Guide" in one volume is always more useful than one in two. We welcome the new maps with which the book is furnished, and every one who takes any interest in hieroglyphics will rejoice that the old wood-blocks of the cartouches of the kings' prænomen and nomens have been replaced by legible hieroglyphic type. A special feature of the book is the Arabic Vocabulary; and although it is hard to understand on what principle the words have been selected, it will, no doubt, be useful to the intelligent visitor to Egypt.

MESSRS. GEORGE HOUGHTON & SON, photographic manufacturers and dealers, have just published a comprehensive illustrated catalogue of photographic apparatus and materials.

MANY chemists have at various times expressed the view that the acid amides, such as acetamide and benzamide, have not the constitution which is usually assigned to them, $\text{NH}_2 \cdot \text{R} = \text{O}$, but are in reality hydroxy-derivatives of the formula $\text{NH} = \text{R} \cdot \text{OH}$. An important contribution to this subject is made in the current number of the *Berichte* by W. Eschweiler, who has succeeded in preparing a new isomeride of glycollamide,

$\text{CH}_2(\text{OH}) \cdot \text{C} \begin{smallmatrix} \nearrow \text{O} \\ \searrow \text{NH}_2 \end{smallmatrix}$, which differs entirely in properties from that compound, and appears to be the hydroxy-compound $\text{CH}_2(\text{OH}) \cdot \text{C} \begin{smallmatrix} \nearrow \text{OH} \\ \searrow \text{NH} \end{smallmatrix}$. The new compound is obtained by

heating the corresponding nitrile, $\text{CH}_2(\text{OH}) \cdot \text{CN}$, with water to a high temperature, and, like glycollamide, is converted into glycollic acid by the action of alkalis. The author has obtained similar isomerides of a number of other acid amides, the full description of which will be awaited with interest.

THE current number of the *Zeitschrift für Physikalische Chemie* contains a paper, by Prof. Ostwald, on the crystallisation of super-saturated solutions and of super-cooled liquids, which adds considerably to our knowledge of this little-studied subject. The chief difficulty of the experiments is caused by accidental infection of the solutions by particles of solid dust. This may be avoided by a proper choice of substances, and it may then be

proved that crystallisation is only caused by the introduction of a crystal of the substance, or of a strictly isomorphous substance. For example, fused salol (melting point $39^{\circ}5$) cannot, at ordinary temperatures, be induced to crystallise by any of the usual means; but if a fine thread of glass be lightly drawn over a crystal of salol, it acquires the power of inducing crystallisation in the liquid; it loses it again by exposure to the air for a few minutes, by wiping with soft sheet india rubber, or by warming above 40° . There is, however, only a limited range of temperature below the melting point in which spontaneous generation of crystals is impossible; the liquid is here in stable equilibrium, except with respect to a ready-formed crystal. Ostwald proposes the name *metastable* for this condition. At still lower temperatures, crystals form spontaneously and without the presence of ready-formed nuclei; the equilibrium is here really labile. The analogy between the phenomena observed during the passage from the liquid to the solid condition, and those observed in the passage from gas to liquid, is pointed out. Notwithstanding the very minute quantity of substance required to start the crystallisation, Prof. Ostwald has succeeded in showing that it has a lower limit. The two methods employed (successive dilution with an indifferent solid substance in the way practised by the homeopaths, or evaporation of minute drops of successively more and more dilute solutions of the solid on a platinum wire, and introduction of the residues into the super-saturated liquid) gave practically identical results. With sodium chlorate solution, for example, containing 107 parts of the salt to 100 of water, the smallest quantity of solid, which would still induce crystallisation, was from a millionth to a ten-millionth of a milligram. The fact that a very minute quantity of ammonia alum induces crystallisation of a solution of potassium alum, instead of being itself dissolved, may be explained by supposing that the dissolved salt diffuses into the solid particle as soon as it comes in contact with the solution; a nucleus of the solid potassium alum having been thus formed, it continues to increase. This explanation is in agreement with the facts that only truly isomorphous salts are capable of forming solid solutions, and also that they alone are capable of mutually inducing crystallisation. For the statement and discussion of a proposition, which may be paraphrased as follows, the paper must be consulted. When a system passes from any given condition to a more stable one, it will not pass into the state which, under the circumstances, is the most stable, but into that which is nearest to the original state.

THE additions to the Zoological Society's Gardens during the past week include a White-throated Capuchin (*Cebus hypoleucus*) from Central America, presented by Sir Henry A. Blake, K.C.M.G.; a Pig-tailed Monkey (*Macacus nemestrinus*) from India, presented by Mr. W. B. Orme; an Egyptian Jerboa (*Dipus aegyptius*) from Egypt, presented by Mr. S. Whitehouse; a Kinkajou (*Cercoleptes caudivolvulus*), a Sharp-nosed Crocodile (*Crocodilus acutus*) from Venezuela, a Rough-eyed Cayman (*Caiman sclerops*), two Tuberculated Iguanas (*Iguana tuberculata*), a Black-pointed Teguxin (*Tupinambis nigropunctatus*), a Chequered Elaps (*Elaps lemniscatus*), an Anaconda (*Eunectes murinus*) from Trinidad, two — Geckos (*Thecadactylus rapicauda*), a Cuvier's Scolecosaurs (*Scolecosaurs cuvieri*), an Agile Lizard (*Mabuina agilis*), three Thick-necked Tree Boas (*Epicrates cenchris*), four Common Boas (*Boa constrictor*), five Cooke's Tree Boas (*Corallus cookii*), a Mocassin Snake (*Tropidonotus fasciatus*), a Boddaert's Snake (*Drymobius boddaerti*), a — Snake (*Coronella calligaster*), a — Snake (*Helicopsis angulatus*) from the West Indies, presented by Mr. R. K. Mole; an Anaconda (*Eunectes murinus*) from Trinidad, presented by Mr. F. W. Ulrich; an Indian Pigmy Goose (*Nettion coromandelianus*) from India, a Laughing Kingfisher (*Dacelo gigantea*) from Australia, a Temminck's Snapper (*Macro-*

clermys temminckii) from the Southern United States, deposited: six Mexican Quails (*Callipepla squamata*) from Mexico, purchased; two Egyptian Weasels (*Mustela subpalmata*), eight Shaw's Gerbilles (*Gerbillus shawi*), an Egyptian Jerboa (*Dipus aegyptius*), three Long-eared Hedgehogs (*Erinaceus auritus*), a Grey Monitor (*Varanus griseus*), nine Egyptian Cobras (*Naja haje*), eight Cerastes Vipers (*Cerastes cornutus*), a Rough-keeled Snake (*Dasyfettis scabra*), three Clifford's Snakes (*Zamenis diademata*), two Hissing Sand Snakes (*Psammophis sibilans*), ten Ocellated Sand Skinks (*Seps ocellatus*), four Vinaceous Turtle Doves (*Turtur vinaceus*), two Lesser Pin-tailed Sand Grouse (*Pterocies exustus*) from Egypt, received in exchange.

OUR ASTRONOMICAL COLUMN.

RESOLVING POWER OF TELESCOPES AND SPECTROSCOPES. —In the current number of the *Memorie della Società Degli Spettroscopisti Italiani* (vol. xxvi., 1897), Prof. F. L. C. Wadsworth discusses the question of the theoretical resolving power of optical instruments, distinguishing between four different cases. According to Rayleigh, the theoretical angular resolving power of any instrument having an aperture of width b is

$$\alpha = m \frac{\lambda}{b}$$

where α is the angle between two fine lines or points which can just be separated (a close double, for instance): λ the mean wave-length of the light employed, b the linear aperture of the instrument, and m a constant, varying according as the aperture is rectangular or circular. The spectral resolution of separation of a spectroscopic image can be determined from this formula by considering the dispersing train of prisms or gratings as a series of spectral images of the slit of the spectroscopic. The four cases which are minutely dealt with are: (1) The resolving power (theoretical) of a spectroscopic train for an infinitely narrow slit and monochromatic radiations, i.e. infinitely narrow spectral lines. (2) The resolving power (also theoretical) for a wide slit and monochromatic radiations. (3) The resolving power (limiting) for an infinitely narrow slit, but for lines of finite width $\Delta\lambda$. (4) The resolving power (practical) for a wide slit and non-monochromatic radiations, ranging for each line over a small value of $\Delta\lambda$, as in (3). This quantity represents the practical resolving power or purity of the spectrum.

The expression for the spectroscopic resolution for the second case differs from that obtained in the first by the presence of a new factor in the denominator of the former. The existence of this necessitates, as Prof. Wadsworth says, a considerable modification of certain statements based on the old formula of purity. Instead of a continual decrease with increase of slit width, the purity of the spectrum actually increases up to a certain point, and is equal to the theoretical resolving power of the instrument. On a further widening of the slit, the purity begins to diminish, but not so rapidly as previously supposed. This modification of the old idea requires, as he points out, a correction in Schuster's remarks on the practical purity of a bright-line spectrum, which gives the purity as 50 per cent. of the resolving power, and not 75 per cent., as Prof. Wadsworth now finds it must be. Other points of equal interest result from this new discussion, and are dealt with in this paper.

PHOTOGRAPHS OF METALLIC SPECTRA. —An investigation of considerable utility in astrophysics (*Sitzungsberichte der König. Preuss. Akad. d. Wiss. zu Berlin*, March 4, 1897) has recently been concluded by Dr. O. Lohse in Potsdam. This consists in the determination of the wave-lengths of the lines in the spectra of cerium, lanthanum, didymium, thorium, yttrium, zirconium, vanadium, and uranium, for the violet region 400μ to 460μ . The spectra were obtained by photography with a spectroscopic fitted with a prism filled with zimmetethyl, the length of the resulting spectrum between the above wave-lengths measuring 180 mm. Spark spectra alone were investigated, and by means of a gas motor and dynamo a considerable strength of current was obtained. During the experiments it was found that the heat affected to an appreciable extent the refractive and dispersive power of the fluid in the prism, although it was not sufficient to be measurable with delicate thermometric instruments. The definition of the lines was therefore to

some extent not very good; for the same reason, exposures longer than 70 seconds were not deemed advisable. These temperature variations made the measurements of wave-length a more difficult task than would have been the case had they been absent, but Dr. O. Lohse seems to have taken the greatest pains to overcome this point; the measures were based on the solar spectrum, Rowland's normal lines being adopted; while the spectrum of iron was used as a comparison. It is stated that the measures may be generally taken as accurate up to a tenth of an Angström unit ($0.01 \mu\mu$), and only in the cases of very dim or broad lines is this limit exceeded; the intensities are given on a scale of tenths. The communication concludes with tables of the wave lengths thus obtained.

THE ROYAL GEOGRAPHICAL SOCIETY.

AT the anniversary meeting of the Royal Geographical Society, on May 17, the President, Sir Clements Markham, F.R.S., in place of the usual annual address, gave a review of the progress of British geography during the sixty years of the Queen's reign. The practice of delivering an anniversary address was commenced in 1837 by the then President, Mr. W. R. Hamilton, in the eighth year of the Society. The first presidential address took the form of a survey of the position of geography at the time, and now forms a suitable landmark by which to estimate the advance that has been made. The Ordnance Survey of the British Islands was fairly under way, and that of India was also in progress. Hydrographic surveys were being pursued by British ships in every sea, and the coasts of Africa had been charted. The whole interior of Africa, most of Australia, and immense territories in Asia and South America were absolutely unexplored. The whole science of oceanography, although created by Rennell, had not yet been recognised.

One of the first pieces of geographical research of the Queen's reign was the memorable voyage of Sir James Clark Ross to the antarctic regions in 1839-41, and this may be held to be the only antarctic expedition ever sent out. Of late years the necessity for an antarctic expedition has become more and more urgent, for many reasons, but chiefly because the science of terrestrial magnetism is at a standstill, owing to the absence of any observations in the far south during the last fifty years. The knowledge which would be acquired by such a magnetic survey will not only be of scientific interest, but will also be of practical importance to navigation. Deep-sea soundings, dredgings, temperatures of the ocean at various depths, meteorology, the distribution of marine organisms, are some of the investigations which would be undertaken by an antarctic expedition with reference to the ocean. Equally important objects would be to determine the extent of the south polar land, to ascertain the nature of its glaciation, to observe the character of the underlying rocks and their fossils, and to take meteorological observations on shore.

Since 1893 the most strenuous efforts have been made to induce the Government to send out another naval antarctic expedition, but without result. We have been told that officers cannot be spared from the ordinary routine of the fleet; that times are much changed from the days of the *Challenger's* commission, and are now much more unsettled. It is forgotten that the naval superiority of Great Britain, in the days of St. Vincent and Trafalgar, "lay not in the number of her ships, but in the wisdom, energy, and tenacity of her officers and seamen," and that these qualities are now to be acquired by such special service as is involved in an antarctic expedition. It is forgotten that in the good old times neither war nor the fear of war were any check to the despatch of naval expeditions of discovery. Captain Cook was sent on his third voyage at a time when France, Spain, Holland, and the American insurgents were all vainly banded together for our destruction. In the midst of the French revolutionary war, Captain Vancouver was calmly surveying the intricate straits and sounds of New Albion, and Captain Flinders was exploring the shores of Australia.

The duty which will not be undertaken by the Government, will now receive the special attention of the Society, which will not appeal in vain for co-operation to the patriotism and energy of private individuals in Great Britain, or to the Governments in Australasia.

In the arctic regions Englishmen have discovered the whole of the American side from Bering Strait to the north coast of

Greenland, and have explored the intricate system of channels and straits which separate the numerous islands. They have thus thrown open to the knowledge of the world a vast amount of information in all branches of science, and have especially taken the largest share in preparing for the solution of the polar problem. Dr. Nansen, by his memorable drift of the *Fram*, has supplied what was needed to complete the means of comprehending what had previously been a mystery. For this great service to geography Nansen has received a special gold medal from the Society; and he has rendered ever memorable, in arctic history, the sixtieth year of the Queen's reign. It saw the solution of the north polar problem.

The main points in the history of the exploration of each continent were touched upon, and the part taken by the Society in the work made plain, the President summing up the results as follows.

"When we contemplate these immediate consequences of our geographical work, it will, I am sure, be felt by all who are connected with this great Society, that it occupies a position of national importance, a position which entails most serious duties and heavy responsibilities. It is our privilege to render frequent services to several departments of the Queen's Government; to take the lead in numerous enterprises, many of which are eventually recognised, in their results, as involving considerable benefits to the nation; and to prepare the means, by our great collections of books and maps, and by the facilities we can give for instruction, for others, including the authorities under Imperial guidance, to follow in our footsteps."

As regards the new departures in the work of the Royal Geographical Society, the President mentioned the institution of a diploma for proficiency in practical astronomy and surveying, and the according of a large measure of support to Mr. Mackinder's scheme of a London School of Geography.

The Royal medal awarded to Dr. G. M. Dawson was handed to Sir Donald Smith, the High Commissioner for Canada; that awarded to M. P. P. Semenov was given to M. Lessar, of the Russian Embassy. The Danish Minister received the awards given to Dr. Thoroddsen and Commander Ryder, while Lieutenant Seymour Vandeleur received the Murchison grant in person.

THE IRON AND STEEL INSTITUTE.

THE annual spring meeting of the Iron and Steel Institute was held on Tuesday and Wednesday of last week, in the theatre of the Institution of Civil Engineers. There were twelve papers down on the list, as follows:—"On the Permeability of Steel-making Crucibles," by Prof. J. O. Arnold and F. K. Knowles; "On the Practice of the Combined Open-Hearth Process of Bertrand and Thiel," by E. Bertrand; "On the Agricultural Value of Sulphate of Ammonia from Blast-Furnaces," by F. J. R. Carulla; "On the Specific Heat of Iron," by Prof. W. N. Hartley, F.R.S.; "On Charging Open-Hearth Furnaces by Machinery," by Jeremiah Head; "On the 'Weardale' Reheating Furnace," by H. W. Hollis; "On the Effect of Phosphorus on Cold Shortness," by Baron Hanns Juptner von Jonstorff; "On the Determination of Hardening and Carbide Carbon," by Baron Hanns Juptner von Jonstorff; "On Malleable Cast Iron," by G. P. Royston; "On Carbon Changes connected with Malleable Cast Iron," by G. P. Royston; "On Microscope Accessories for Metallographers," by J. E. Stead, Member of Council; "On Central Blast Cupolas," by T. D. West.

Of these six were read and four discussed. Six papers were taken as read, and not discussed. The latter consisted of the papers of Messrs. Carulla, Hartley, Stead, and West, and the two papers of Baron Hanns Juptner von Jonstorff. Mr. Royston's papers were those read and not discussed.

The formal proceedings having been got through, and the report of the Council having been read, the past-President, Sir David Dale, introduced the new President, Mr. E. P. Martin, who, as is well known, is the manager of the Dowlais Iron Company of South Wales. Sir Frederick Abel was next presented with a Bessemer medal; and then the President proceeded to read his inaugural address. This was of an eminently practical nature, and gave a most interesting description of the growth of the iron and steel industry at Dowlais almost from the earliest times, these historic works having been established for over a hundred years. It is interesting to notice that in the year 1791 the quantity of coal consumed in making a ton of iron in

the South Wales district was no less than 8 tons a hundred-weight; while the average make of pig iron per furnace per week was 20 tons. Last year the maximum output of blast furnaces at Dowlais was 1600 tons per week, the consumption of fuel (coke) being equal to about 1½ tons of coal per ton of pig. The description of the manner in which the steel industry was introduced at Dowlais and its subsequent increase was commented upon by the President; one of the first works to take up the Bessemer process being the Dowlais Ironworks. Sir Henry Bessemer himself has stated that the first ingots were made from grey Blaenavon, which was converted into soft iron or steel without spiegel or manganese, the converter being lined with Stourbridge bricks. Menelaus, Edward Williams, and Edward Riley made successful tests at Dowlais immediately after Bessemer read his historic paper at the Cheltenham meeting of the British Association; the latter only of the three gentlemen named survives, he being present at the meeting and taking part in the discussion. When Mr. Bessemer came to Dowlais to continue the experiments a convenient refinery happened to exist opposite the furnace making cinder pig, and the iron from this furnace was by a singular and most unfortunate mischance employed for Mr. Bessemer's trials. The result, naturally, was very disappointing; and it is characteristic of the troubles inventors have to meet, that it was then contended such accidents were inherent to the process. Mr. Martin states that some time ago he came across one of these Bessemer ingots, which he analysed. As might be imagined, the phosphorus was extremely high—in fact, ridiculously so, being nearly 2 per cent. Unfortunately, the mistake in regard to the pig iron was not ascertained until some time after, so that, though the Dowlais Iron Company was one of the first to take up a licence to make Bessemer steel, they did not begin to roll steel rails till 1864. It will surprise a good many people to learn that large quantities of iron rails were rolled at Dowlais as late as the year 1882. The substitution of Bessemer and Siemens steel for wrought iron has reduced the number of puddling furnaces at Dowlais from 255 to 15.

The statistical part of the address was extremely interesting, especially that relating to American competition. American iron and steel makers exceed those of this country enormously by the output they obtain from their appliances. The Carnegie Steel Works have, the President stated, again surprised the world by the tremendous strides they have made. The Duquesne furnaces hold the world's record. Their best month's work has been 17,182 tons, or 572 tons per day, the actual best day's output being 690 tons, with a consumption of coke, as an average of a month, of 1700 lbs. per ton of pig iron. That is with a 57 to 60 per cent. ore, but in our country with a 48 to 50 per cent. ore we look on a make of a little over 1600 tons per week with satisfaction. "When this is compared with the gigantic outputs obtained from the Duquesne furnaces," the President said, "during the same period, it must be admitted that the results achieved here leave much to be desired." It may be added that still larger furnaces are being erected in America, and it is confidently expected that these will produce 1000 tons of pig iron per furnace per day. The Bessemer Steel Works at Duquesne are on the same huge scale as the blast furnaces, and other American works mentioned by the President are on a similarly imposing plan. In spite of the high wages paid in America, it has been possible by working in this wholesale manner to bring the cost of production to a very low ebb, until, as has been recently stated, it is a question now not how much steel we should send to America, but how far we can meet American competition within our own boundaries. The details as to freights, iron ore supply, by-products, wages and labour cost, railway rates, and other matters of a like nature were also discussed in the address.

Mr. Hollis's contribution was the first paper to be read. The Weardale furnace is of the re-heating type—that is to say, it is used for heating slabs, &c. It would be difficult to give a description of the design without the drawings by which the paper was accompanied. The author's object was to obtain continuous working without reversing, and yet to dispense with the regenerating chambers altogether, on account of their cost. It was also a point kept in view to introduce the flame in such a way as to obtain equal heating over the whole floor of the heating chamber. The broad principle upon which these ends was effected was by constructing the furnace so that the gas-flame would be introduced through, and surrounded by, a stratum of highly-heated air in the roof of the furnace. The flame would pour down on the slabs or piles to be heated, and

would pass along the floor of the working chamber to an outlet port at each end. Judging by the details given by the author in his paper, and from the testimony of many competent judges during the discussion, the Weardale furnace seems to give satisfactory results.

The next paper read was the contribution of Messrs. Arnold and Knowles. The authors stated that in passing pure carbonic oxide over white-hot aluminium the metal became coated with a grey mixture of aluminal and carbon. Also, on blowing forty gallons of carbonic oxide through molten mild steel, containing about 4 per cent. of aluminium, the percentage of carbon was raised; this power of aluminium, to reduce carbonic oxides at high temperatures, has since been used to measure the permeability to furnace gases of clay steel melting crucibles. The experiments were carried out by melting ingots of Swedish iron, containing 99·85 of iron, with calculated quantities of aluminium. The ingots were broken up and re-melted, and it was found that in each case the greater part of the aluminium had been oxidised, and that the carbon liberated had converted the iron into hard steel; in one case remarkably high in silicon, doubtless reduced from the clay of the crucible during the prolonged time the steel was maintained in a molten state. The most important practical feature of the experiment was the fact shown that the walls of a crucible form little protection against the absorption of sulphur by the metal inside it. A good discussion took place on the reading of this paper, it being opened by Prof. Roberts-Austen, who gave what was a valuable supplement to the paper, consisting of details of work of a similar nature carried out by previous investigators. This question of the porosity of crucibles was, Prof. Roberts-Austen said, the dominant problem in the minds of metallurgists early in the century. The reading and discussion of these two papers, and of the President's address, occupied the first sitting of the meeting.

The first paper taken on the Wednesday was that of Mr. Jeremiah Head, in which he described an apparatus worked by electrical power, which has been introduced in America for charging Siemens furnaces. In this country hand labour is universally adopted for the purpose, although mechanical means are about to be introduced in some works. It is by such appliances as those described by Mr. Head that the American steel-makers are enabled to obtain the enormous output to which reference has already been made. It would be difficult to describe the machine without the diagrams which Mr. Head had shown upon the wall, or the very beautiful working model which Mr. Archibald Head exhibited at the conclusion of the reading of the paper. It must suffice to say that a powerful frame or gantry is run up in front of the furnace; by means of an electric motor a massive arm is projected from this. The arm is provided with what might aptly be called a hand, which grasps the boxes containing the furnace materials entirely by automatic means. The furnace door is then opened and the arm carries the iron box, with its charge of pig iron, ore or scrap, into the furnace; by another electric motor the arm is rotated, depositing the materials into the glowing bath of the furnace. The box is then withdrawn by the arm, the operation being continued until the whole charge is in position on the hearth; the apparatus is then moved on to the next furnace. The speakers during the discussion who had seen the apparatus at work gave testimony as to its efficiency.

The last paper read and discussed at the meeting was that of Mr. Bertrand. The combined process, to which reference is made in the title, consists of two open-hearth furnaces. The operations are divided into two stages, the metal being run, when half-treated, through a header from the primary to the secondary furnace, the latter being of the nature of a finery furnace. The perfect elimination of the phosphorus is not intended in the upper furnace, and therefore less lime may be added than would be otherwise necessary, and the quantity of slag to be melted is materially diminished. The plan of working adopted consisted in charging nearly all the siliceous and phosphoric pig iron into the primary furnace, and nearly all the scrap into the finishing furnace, adding in each such quantities of ore, lime, &c., as they were demanded. The advantage claimed is an increased output and a material reduction in the consumption of lime and basic material for lining the furnace hearths; a saving of fuel also takes place, it is thought. A long discussion followed on the reading of this paper.

The summer meeting this year will be held at Cardiff.

The annual dinner of the Institute was held on Tuesday,

May 11, at the Hotel Cecil, the President occupying the chair. Among those present were the Duke of Teck, Sir Bernhard Samuelson (past President), Sir David Dale (past President), Sir Lowthian Bell, Sir Courtenay Boyle, Sir Andrew Noble, Sir Henry Mance, Prof. Dewar, F.R.S., Prof. Ayrton, F.R.S., Dr. Ludwig Mond, F.R.S., Mr. Norman Lockyer, C.B., F.R.S., and Mr. B. H. Brough (the Secretary). After the loyal and patriotic toasts had been duly honoured, Prof. W. C. Roberts-Austen, C.B., F.R.S., proposed "Scientific and Professional Societies," which was acknowledged by Sir John Evans, F.R.S., and by Mr. J. Wolfe Barry, C.B., F.R.S. The toast of the evening, "Prosperity to the Iron and Steel Institute," was proposed by Sir Courtenay Boyle.

THE CULTURAL EVOLUTION OF "CYCLAMEN LATIFOLIUM."¹

ON the occasion of the discussion on "Variation in Plants and Animals," which took place on February 25, 1895, it occurred to me that it might be useful to give an illustration of the amount of change which has been effected in a plant by continuous selection under cultivation in a comparatively short time. I, therefore, placed upon the table an example of the wild and of the cultivated form of the garden "cineraria" (*C. cruenta*).

The choice of this species was purely accidental. It was, however, violently impugned. It was contended that the garden cineraria was not the result of the development of a single species, but that it was of multiple origin, and the result of the intercrossing of several. It was further contended that its change from the wild form had not been gradual, but by discontinuous steps or "sports." Neither contention seemed to me well founded. But I admit that, owing to the lapse of time since the so-called "improvement" of the cineraria commenced, it is impossible to give formal proof that the process has been what I described. Mr. Darwin met with the same difficulty. He remarks: "We know hardly anything about the origin or history of any of our domestic breeds" ("Origin," 6th ed., p. 29). As is, however, well known, he regarded them as the result of accumulation by selection of successive slight variations. But he also tells us that "the chance will be infinitely small of any record having been preserved of such slow, varying, and insensible changes."

It seemed to me important, therefore, to obtain the history of some cultivated species which would not be open to the objections urged in the case of the cineraria.

After some consideration I selected the plant known in gardens as *Cyclamen persicum*. Owing to the kindness of the skilful horticulturists who have worked upon it, I am able to place on record a nearly complete history of the changes it has undergone.

The genus *Cyclamen* belongs to the small order *Primulaceae*, which in its affinities is somewhat isolated. *Cyclamen* itself is distinguished from the rest of the tribe *Lysimachieae*, to which it belongs, by the reflexed segments of the corolla.

Cyclamen persicum, Mill., is a name given by gardeners to a form slightly modified by cultivation of *C. latifolium*, Sibth., a species confined to Greece and Syria. There is a good figure of the type in Sibthorp's "Flora Græca" (t. 185). It has pink flowers, with a ring of darker colour at the throat. The species is said to have been first cultivated in Europe at Lille in 1731 ("La Semaine Horticole," 1897, p. 23), having been introduced from Persia. There must have been some error as to its origin, for Boissier points out that the species is not found in that country ("Flora Orientalis," vol. iv. p. 12). In all probability it was obtained from Syria. The Lille plant ultimately went to Ghent, and it has been asserted that all the cultivated forms in existence are descendants from this one individual. The assertion cannot be proved, but is not improbable. It is known to have been a variety with white flowers. As will be shown, the forms now in cultivation have been derived from a white-flowered one, which in turn might well have been derived from the Lille plant.

Such a modified form was, in fact, that described by Miller, in 1768, in the eighth edition of his "Gardener's Dictionary," under the name of *Cyclamen persicum*. He describes the flowers as "pure white with a bright purple bottom." It was figured in the *Botanical Magazine* in 1787 (t. 44), and it has come down little altered to our own day. In 1875 Boissier describes it as

"forma hortensis a me nunquam spontanea visa." It still exists in cultivation, and is the (old) "crimson and white" of Messrs. Sutton. It seems always to have been popular in cultivation on account of its agreeable fragrance. This confirms the Syrian origin of the original stock, for a white-flowered form "is found in Palestine which is very fragrant" (*Roy. Hort. Soc. Journ.*, N. S., vol. xiii. p. 163).

Early in the century some colour variations were in cultivation. Several as well as the typical *C. persicum* were figured in the "Flore des Serres" in 1877 (t. 2345). These record the amount of change from the wild type which had been accomplished in a century and a half. One striking seminal sport (*C. persicum*, var. *laciniatum*) is figured in the *Botanical Register* in 1827 (t. 1095). It is remarkable for spreading corolla-segments broader than usual, and cut at the edges. It does not appear to have been perpetuated, but in some degree it anticipated some of the remarkable modern developments.

I am informed by Mr. James Martin, the accomplished propagator of Messrs. Sutton, that the recent remarkable development of the cyclamen began about 1860, and, at any rate in their hands, started with the old "crimson and white." It will be seen from the accompanying figures how little this differs from the wild type. Fig. 1 represents a flower of the latter from a plant imported by Messrs. Sutton from Syria after six years of cultivation. It is not appreciably altered. Fig. 2 represents a flower of their "crimson and white"; it only differs from the wild type in having shorter, broader, and less twisted corolla segments.

In considering the progress which has been made since 1860 under the skilful hands of Mr. Martin and others, it is important

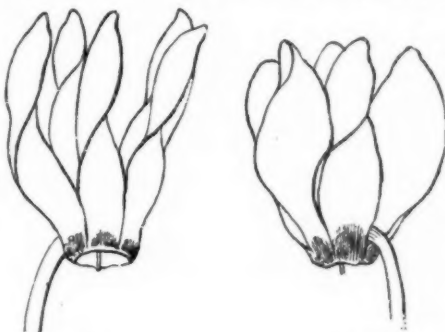


FIG. 1.

FIG. 2.

to bear in mind that there is no question of hybridity. *Cyclamen latifolium* has resisted every attempt to cross it with any other species. We are dealing then with the evolution under artificial conditions of a single species. Further, in the following statement, I have confined myself to the result of continued self-fertilisation, and have not thought it necessary to investigate the results of crossing races which have assumed characters more or less distinct.

Size.

Mr. Martin strongly insists on the principle laid down by Mr. Darwin from De Vilmorin, that "the first step is to get the plant to vary in any manner whatever" ("Animals and Plants under Domestication," vol. ii. p. 262). As Mr. Martin puts it, "the breeder must work with nature." It is his practice to seize the smallest deviation, even so small an indication as the slightest difference in a cotyledon of a germinating seed. The first direction of work would, however, for commercial purposes, be to develop the size of the corolla. Figs. 3 and 4 show two stages which have been reached by progressive selection from "crimson and white." Messrs. Sutton have sent me photographs of the largest flowers hitherto produced by them. Fig. 5 is copied from one of these. The vertical depth is 3 inches. This is more than double that of the form with which they started; the increase in breadth of the segments is at least six times. This represents the continuous work of forty years. As the work was not done for a scientific purpose, the whole of the progressive steps have not been preserved or recorded. Only saleable stages have survived. But Mr. Martin emphatically denies that they have been attained by other than progressive selection, or

¹ "The Cultural Evolution of *Cyclamen latifolium* (Sibth.)." By W. T. Thistlethorn Dyer, C.M.G., C.I.E., F.R.S. Received and read at the Royal Society, March 18.

that they have been reached by leaps and bounds. In developing any particular character it is, to use his own words, always done by a "ladder," *i.e.* continuous self-fertilisation and selection. The stage shown in Fig. 3 owes its preservation to its having retained fragrance. Beyond this stage fragrance has been lost.

An interesting question is whether there is any limit to the extent to which an organ can be developed, and if so, what? It is to be hoped that Mr. Martin will continue his

me that it had been of frequent occurrence. Spreading flowers had always been destroyed as departing from a desirable type. More recently, on account of their orchid-like habit, they had taken the popular fancy, and had been preserved.

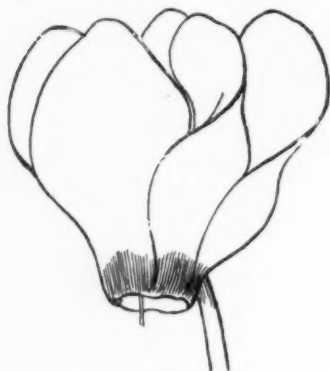


FIG. 3.

work in this direction and strive, if only as a matter of scientific interest, to increase the size of the corolla to the maximum possible. The only check will probably be found to be the general balance of nutrition.

Spreading.

I was much struck to find amongst a magnificent series of specimens, kindly sent me by Messrs. Sutton, forms with the segments of the corolla spreading instead of reflexed (Fig. 6).

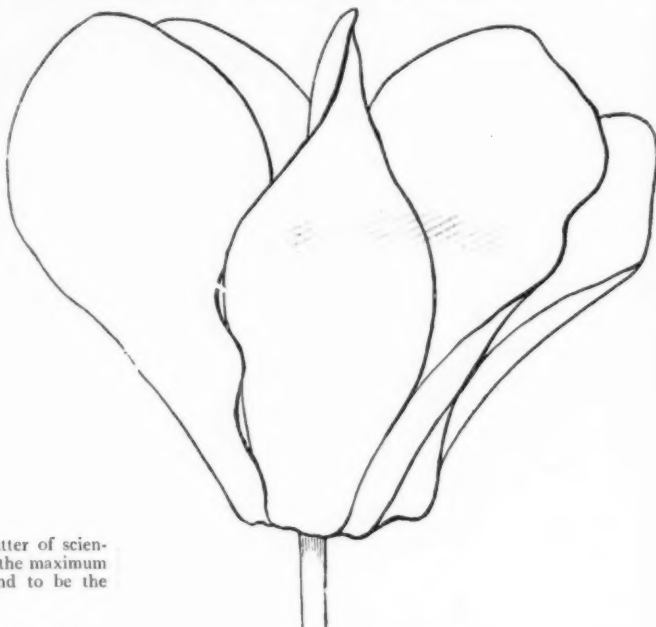


FIG. 5.

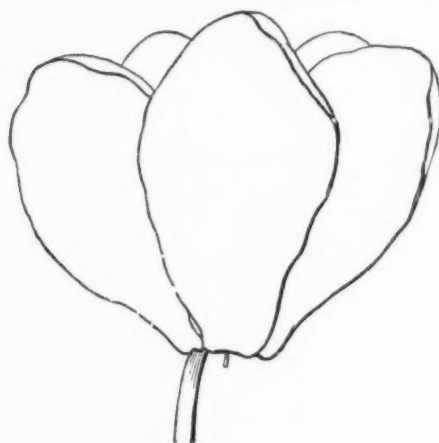


FIG. 4.

I have received even more striking examples from Messrs. Hugh Low and Co. This is remarkable because, as I have already pointed out, the latter is a distinctive generic character in *Cyclamen*. Although the alteration in the appearance of the flower is enormous, the structural change is slight. It is merely a matter of direction of growth. It amounts, however, to the loss of a generic character and a reversion to a more generalised type. The change is therefore essentially atavistic.

I was unable to obtain from Mr. Martin any explanation of how this particular variation had come about, but he informed



FIG. 6.

Doubling.

Even in the wild type there is a tendency to a slight multiplication of the corolla segments. Mr. Martin has worked

upon this, and has produced flowers such as shown in Fig. 7. He seems to think that there is no limit to which this multiplication cannot be carried practically, and hopes in time to produce "mop-headed" flowers like a chrysanthemum. The so-called doubling of flowers, as in the rose, is a teratological phenomenon, and is due to the conversion of stamens into petals. But in *Cyclamen* this is not the case. The stamens, which are normally equal in number to the corolla segments, are also multiplied. Although a quinary symmetry is general in the *Primulaceae*, *Trientalis*, a near ally of *Cyclamen*, ordinarily exhibits a considerable range in the number of parts of the flower. Here again *Cyclamen*, under artificial conditions, shows a reversion to a more generalised type.

Colour.

There is evidence that seminal variation as regards colours occurred at least as early as 1820, but the modern forms with large coloured flowers, according to Mr. Martin, originated in a different way and can be traced back to the old crimson and white. That preserves the crimson ring round the throat, but is otherwise an albino. There is nothing remarkable in this. Any species in nature may produce white flowers; albinism is in effect the commonest of all variations. "Giant white" (Figs. 4 and 5) is a pure albino, in which the crimson ring has been suppressed.

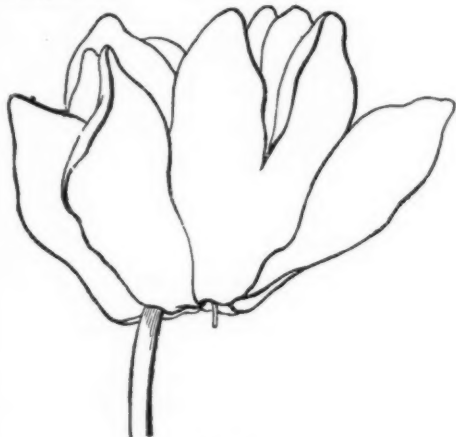


FIG. 7.

The modern coloured forms were obtained in the first instance by selecting forms in which the coloured ring showed a disposition to spread into the white corolla segments. The first indication would be a scarcely perceptible streak. By selection from self-fertilised plants the streak was widened into a stripe. Continuing the process, the stripes united, and a uniformly coloured flower was obtained.

The more striking colours, such as that of "Vulcan," which is a dark crimson, were, however, obtained not by progressive selection, but amongst the progeny of cross-fertilised plants.

I learn from Messrs. Hugh Low and Co. that coloured varieties, of course when self-fertilised, come true from seed. This is in accordance with a well-known principle (Darwin, "Cross and Self-fertilisation," p. 460).

The Butterfly Form.

This has been obtained independently by several horticulturists. The segments are partially spreading, and concave on their inner surface. One of the most remarkable is that raised by M. de Langhe-Vervaeke; it is represented in Figs. 8 and 9. He informs me that "these are the products of the eleventh year of improvement." He adds: "I never crossed them with any other strain; I do not like crossing races; I prefer improving them." He has kindly favoured me with the following detailed account of the mode in which the strain has been developed and improved. I quote it in his own words:—

"Les *Cyclamen Papilio* que j'ai obtenus sont issus directement des *Cyclamen persicum*, var. *giganteum*."

"Il y a environ une douzaine d'années je remarquais parmi mes semis de *Cyclamen* une plante qui attira mon attention par l'extrême beauté de son feuillage dentelé et marbré. En examinant la plante, je vis qu'elle portait une grande quantité de boutons; ceux-ci étaient de forme plus arrondie et plus courte que ne le sont généralement ceux des *Cyclamen persicum*. La plante fut mise à part; quand elle commença à fleurir, elle m'étonna par la forme bizarre de ses fleurs. Ces diverses circonstances m'engagèrent à en recueillir les graines."



FIG. 8.

"L'année suivante j'obtins quelques jeunes plantes. Au moment de leur floraison, elles purent être comparées à la plante mère."

"Les plus parfaites de ces plantes furent choisies pour servir de porte-graine, et leurs fleurs furent fécondées entre elles. L'année suivante je fus assez heureux pour constater un nouveau progrès; mes gains surpassaient leurs parents que j'avais conservés. On pouvait apercevoir, dans ces semis aux caractères persistants, le point de départ d'une race nouvelle."

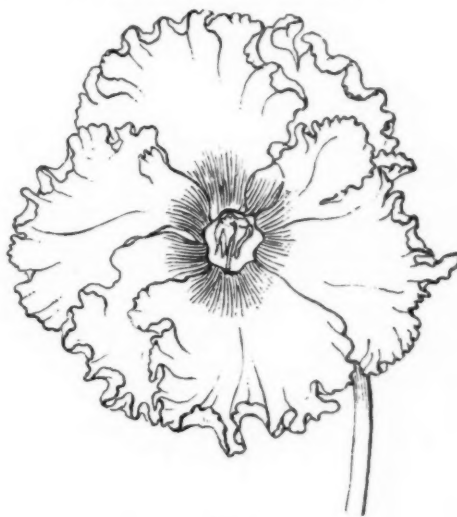


FIG. 9.

"Je continuai dans cette voie; au bout de quatre ans, j'étais en possession de quelques sujets fort remarquables. Les pétales des fleurs étaient amples et plus longs; ils se redressaient comme les ailes d'un papillon qui s'apprête à prendre son vol."

"La race se caractérisa chaque année davantage."

"Encouragé par le résultat déjà obtenu, je m'occupai à rechercher la diversité des coloris. Après quatre années je ne

possédais dans mes semis que des plantes à fleurs rouges ; j'avais en triant les sujets pour la reproduction toujours écarté les fleurs les moins brillantes. Il s'agissait maintenant d'obtenir des fleurs à couleurs pâles. Des efforts nouveaux furent fait dans cette voie ; je vis au bout de deux ans après apparaître la première fleur aux pétales blancs et à onglet rouge ; dès lors les croisements se multiplièrent au point qu'après la neuvième année la perfection des formes et des coloris est telle que tous ceux qui voient mes *Cyclamen Papilio* sont unanimes à reconnaître leur mérite et leur perfection des fleurs."

In this case the basis of the new strain was found in a marked variation or "sport." The deviation from the type could not, however, have been very marked. The most remarkable feature in "Papilio" as now developed is the curled and toothed margin of the corolla segments. These peculiarities repeat characters which occur elsewhere in the order. In *Soldanella* the toothed is conspicuous ; curling occurs in cultivated varieties of *Primula sinensis*. It is interesting to observe in "Papilio" that in the primary variation there was a correlation between the toothed of the corolla segments and of the leaves.

Cresting.

The most remarkable form which has made its appearance under cultivation is that in which a plumose crest has developed on the inner surface of each corolla segment. This is shown in Fig. 10, which represents the "Bush Hill Pioneer," raised by Messrs. Hugh Low and Co. I quote the account of its



FIG. 10.

development with which they have been so good as to furnish me :—

"This interesting variety was first observed in our nurseries some four years since, but how it originated we are unable to say.

"At that time, the only peculiarity about the variety was a very slightly raised rib running part of the way up the petals, and showing no tendency to branch. This was, however, considered sufficiently curious to follow up, and we seeded it with its own pollen.

"The young plants from this showed a decided improvement, the rib in some cases showing a marked tendency to branch. The best varieties (ten in number) were again fertilised with their own pollen, and the plants now being exhibited by us have resulted, although, needless to say, they are among the finest obtained up to the present, though all show a further improvement, every flower having a well-branched feather on the petals.

"We have this year found some colour in one plant, and we believe we shall have no trouble in obtaining crested flowers in a variety of colours."

The corolla segments of *Cyclamen* have no mid-rib. The appearance of such a structure is a reversion to the original leaf-type. The development of a crest from a mid-rib carries reversion very far back indeed. The branching of a leaf-structure in the plane in which it is expanded is common enough ; branching in a plane at right angles to this is rare.

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Leafy outgrowths frequently occur from the mid rib in the cabbage (Masters' "Teratology," p. 455). In this case the structure of the leaf approximates to that of a stem, of which, indeed, the leaf may be regarded as a modification.

An interesting fact with regard to this singular variation is that it has appeared more than once, and independently. It first occurred in 1885, but seems afterwards to have been lost sight of (*Gardener's Chronicle*, 1885, p. 536). It has also occurred in a red-flowered form in France (*Revue Horticole*, 1897, pp. 98 and 130), in which case it was also perpetuated by seed.

I have not succeeded in discovering any similar structure in any primulaceous plant occurring in a wild state. Dr. Masters, however, informs me that it has been observed in cultivated forms of *Primula sinensis*. The tendency thus seems to be latent in the order, though why it should be so I am unable to explain.

Some theoretical interest appears to me to attach to the rapid development of so striking an ornament of a corolla segment. Such appendages are frequent enough in orchids, and are regarded as adaptations to cross-fertilisation by insects. Their gradual evolution might be thought to require a long period of time ; but in the present case we have definite evidence that such a structure may be developed by selection with great rapidity.

Conclusion.

(1) The facts which I have stated appear to me to establish the result that, when once specific stability¹ has been broken down in a plant, morphological changes of great variety and magnitude can be brought about in a comparatively short space of time. This appears to me to have a very important bearing on the rate of evolution. Mr. Darwin quotes Lord Kelvin as insisting "that the world at a very early period was subjected to more rapid and violent changes in its physical condition than those now occurring"; and he adds, "Such changes would have tended to induce changes at a corresponding rate in the organisms which then existed" ("Origin," sixth ed., p. 286). That changes may be effected with considerable rapidity cannot, I think, be denied.

(2) It is further, I think, abundantly proved in the present case that, though sudden variations do occur, they are, as far as we know, slight as long as self-fertilisation is adhered to. The striking results obtained by cultivators have been due to the patient accumulation by selection of gradual but continuous variation in any desired direction.

(3) The size which any variable organ can reach does not appear to be governed by any principle of correlation. Large flowers are not necessarily accompanied by large leaves. Under natural conditions size is controlled by mechanical limitations and by the principle of economy. Nature cannot afford to indulge in anything unnecessary for the purpose in view (see Darwin, "Origin," 6th ed., p. 117).

(4) The general tendency of a plant varying freely under artificial conditions seems to be atavistic, i.e. to shed adaptive modifications which have ceased to be useful, and either to revert to a more generalised type or to reproduce "characters which are already present in other members of the same group" (see Darwin, "Origin," 6th ed., p. 127). This conclusion must, however, be accepted with caution, for we must remember that in a case like the present we are only acquainted with variations which have been preserved with a particular end in view.

(5) The case of "cresting" shows that the plant still possesses the power to strike out a new line and to develop characters which would even be regarded as having specific value, as in the total change which has been effected in the form of the leaf in *Primula sinensis*. If such a race developed any degree of sterility with other races, it would have satisfied Huxley's criterion for the artificial production of a new species.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Savilian Professorship of Geometry being vacant by the death of the late Prof. Sylvester, the Electors will proceed to the appointment of a successor in the course of the present Term. The duties of the Professor are defined in the following provisions of the Statutes :—"The Savilian

¹ For a general discussion of the principles of variation and specific stability, see NATURE, vol. II. pp. 459-461.

Professor of Geometry shall lecture and give instruction in pure and analytical geometry. The Professor shall reside within the University during six months, at least, in each academical year, between the first day of September and the ensuing first day of July. He shall give not less than forty-two lectures in the course of the academical year; six at least of such lectures shall be given in each of the three University Terms, and in two at least of the University Terms he shall lecture during seven weeks not less than twice a week." The emoluments of the Professorship as determined by Statute are as follows:—"He shall be entitled to the emoluments now assigned to the Professorship and derived from the benefaction of Sir Henry Savile, Knight, or from the University Chest; and shall receive in addition the emoluments appropriated to the Professorship by the Statutes of New College." The total amount of these emoluments is 900*l.* a year, and cannot exceed that amount. Applications, together with such papers as a candidate may desire to submit to the Electors, must be sent to the Registrar of the University, Clarendon Building, Oxford, on or before June 12, 1897.

All examinations within the University will be suspended on June 22.

Prof. Gotch, F.R.S., has been elected a Delegate for the extension of teaching beyond the limits of the University.

Mr. W. Garstang, Fellow of Lincoln College, will give a public lecture in the hall of Lincoln College on May 25, on "Recent Researches in Marine Biology."

The Botanical Museum of the Department of Botany has been undergoing rearrangement under the supervision of Mr. Church. The work is now nearly completed. Some 4000 new specimens have been added to the Herbarium during the past year.

The Curators of the Botanic Garden have presented their ninth Annual Report to Convocation. It is satisfactory to note that the deficit of last year has been considerably reduced, and a great number of exchanges with other Gardens have been made.

At a meeting of the Junior Scientific Club, held on Friday, May 14, papers were read by Messrs. E. S. Goodrich and E. F. Morris. A proposal to amalgamate with the Ashmolean Society fell through, the Club not being in a condition to bear the somewhat heavy financial burden which would be consequent on amalgamation.

An examination for the Shute Scholarship in Animal Morphology (a Non-Collegiate scholarship) is announced. It will take place in July 1897, the scholarship being of the annual value of 50*l.* Candidates must be in need of assistance at the University. The scholarship is open to all, without limit of age, with the exception of members of the University of more than eight terms' standing. Names are to be sent to the Censor of Non-Collegiate Students, High Street, Oxford, on or before Monday, June 14.

CAMBRIDGE.—The Committee for promoting the admission of women to titular degrees appears to be disintegrating. On May 17 a fly-sheet was circulated by the President of Queens' (Dr. Ryle), the Registrar (Mr. J. W. Clark), Mr. E. S. Roberts (tutor of Caius), and Mr. W. L. Mollison (tutor of Clare), expressing their decision to withdraw their support from the proposals before the Senate. They are now convinced the removal of the alleged grievance, felt by a comparatively small number of women, would be bought at too high a price, when considerably more than half of the resident members of the Senate are bitterly opposed to the measure, and would view it, if carried, as a grave betrayal of trust. They express the opinion that a victory under such conditions would be worse than a defeat, and that the passing of the Graces would prove injurious to the best interests of the University. They hope that before long a solution will be found in which the Universities of Oxford and Cambridge may act together. There is good reason to believe that the views which these influential members of the Senate have had the courage publicly to express, are shared by others who are still, nominally, on the side of the women, and that these will now either abstain from voting, or follow the lead now given to them by giving their voice against the much-discussed resolutions. The result will be declared soon after 3 p.m. on Friday afternoon, and, in the interests of peace, it is hoped that the majority will be decisive. A narrow victory for either side would settle nothing. A London Committee of about one hundred members has been formed to secure the rejection of the Graces, and is actively engaged in disseminating

information and securing promises to vote *non-placet*. Lord Kelvin is chairman, and Dr. E. Freshfield secretary; among the other members are the Astronomer Royal, the Registrar of the Royal College of Physicians, Dr. Norman Moore, Lord Stanmore, and Sir Walter Besant.

Mr. W. N. Shaw, F.R.S., has been reappointed a University Lecturer in Experimental Physics.

Applications for leave to occupy the University Tables in the Zoological Stations at Naples and Plymouth are to be sent to Prof. Newton, F.R.S., Magdalene College, by May 26.

THE President of the Board of Agriculture has appointed a Departmental Committee to inquire into the working of the Universities and College Estates Acts, 1858 to 1880, and to report whether any, and, if so, what, amendments therein are desirable.

It is perhaps worthy of notice that a new Board school, erected in Faraday Street, Walworth, at a cost of 15,000*l.*, has been named the Michael Faraday School, in honour of Faraday, who was born in the parish. May the children who receive instruction in the school strive to follow the example set them by the great investigator whose name the school bears.

THE International Submarine Telegraph Memorial Committee has granted "The Sir John Pender Gold Medal," value 5*l.* 5*s.*, to the Glasgow and West of Scotland Technical College. It is given annually to the best student who at the same time obtains the college diploma in electrical engineering. At the end of this session, which terminated last week, it was awarded to Mr. David Robertson.

Science announces the following gifts to educational institutions in America:—The will of the late John Foster, of Boston, gives 120,000 dols. to public purposes, including 10,000 dols. to the Massachusetts Institute of Technology; the will of the late Charles Bell, of Springfield, Mass., bequeaths 7000 dols. to Wellesley College for a scholarship fund; Brown University receives 10,000 dols. by the settlement of the will of the late Mrs. Maria L. Benedict, of Providence.

IN the House of Commons, on Monday, Mr. Brynmor Jones asked the First Lord of the Treasury whether it was the intention of the Government to reintroduce the University of London Bill this Session; and, if so, when. In reply to the question, Mr. Balfour said that the President of the Council hoped to introduce a Bill into the House of Lords shortly. There is some reason to expect that the difficulties, which prevented it from passing last year, will be removed, and certain negotiations are going on with that object.

THE following are among recent appointments:—Mr. C. H. Warren to be Instructor in Mineralogy in the Sheffield Scientific School of Yale University; Dr. Karl Paal to be Professor of Chemistry at Erlangen; Dr. Raphael Freiherr von Erlanger, privat-docent in Zoology at Heidelberg, to be Professor; Dr. F. Foerster, privat-docent in Chemistry at the Dresden Technical High School, to be Professor; Dr. Petzold, privat-docent in Practical Geometry at the Technical High School at Hanover, to be Professor; Dr. Anding, privat-docent in Astronomy at Munich, to be Observer on the International Commission for the Measurement of the Earth; Dr. J. Thomayer to be Professor of Pathology at the Bohemian University at Prague; Mr. J. F. Crawford to be Demonstrator in Experimental Psychology in Princeton University.

IN October last a Committee was appointed "to inquire into the mode in which the grants to Science and Art Schools are distributed, and to report whether any alteration should be made therein." The Report of this Committee has just been published as a Blue-book, in which is also included a revised edition of the Science and Art Directory, embodying the recommendations of the Committee. Some of the important changes advocated are as follows:—(1) "In counties and county boroughs in England possessing an organisation for the promotion of secondary education, the authority so constituted may notify its willingness to be responsible for the science and art instruction within its area." This recognition of local authorities as those who should be responsible for secondary instruction will, the Committee thinks, simplify the work of central administration, secure greater efficiency in the schools, and be a protection against this undue competition and multiplication,

(2) To encourage the study of languages and literary and economic subjects, and to meet the objection that the Science and Art grants tend to promote a one-sided education, it is proposed that any *bond fide* student attending an evening science or art class shall be able to earn a grant by attendance at University Extension courses of lectures. It is expected that the grants made on this account will only absorb an infinitesimal proportion of the total grants disbursed by the Department of Science and Art. (3) Hitherto certain restrictions as to income have existed which precluded some students from earning grants or winning scholarships. These are to be abolished; but, to prevent abuse, a regulation has been added that schools in receipt of payment must be "approved by the Department as suitable in character and financial position to receive aid from public funds," and with reference to persons eligible to hold certain scholarships and exhibitions, a provision has been added that "the Department may refuse to fill them with persons whose circumstances do not appear to warrant such aid." (4) It is suggested that the Honours examination in each subject should be divided into two parts, one less advanced in character than the other.

LORD HERSCHELL, the Chancellor of the University of London, took the opportunity of referring to the need of a teaching University, at the meeting held on Wednesday in last week for the distribution of medals and certificates. A University was not worthy of the name, he is reported by the *Times* to have said, unless it inspired a love of knowledge for its own sake. It was this conception of the mission of a University which made him desire to introduce a different element into their University, so that it should no longer be the main object of its members to obtain degrees; and if, even as regarded a minority of students, the function of teaching were added to that of examining, the idea of a University would be realised in a far higher degree than it was at present. The question of a change in their constitution had been before the country for many years, and he would not approach it in a controversial spirit, but he could not but express a hope that some step would soon be taken. The discussions of the last two years had removed many misconceptions between those who held widely different views from each other; and the progress of consideration and the interchange of views might, he thought, lead to approximation between those who appeared to stand asunder. But he was inclined to think that the questions at issue might better be solved by an independent body than by mutual concessions on the part of opposing parties. The danger of compromise was that each side might concede something which ought not to be conceded—a danger which an independent body might avoid. The main objection urged against change was that it might tend to lower the quality of degrees. If that were likely to be the result, he should be the enemy of change; but he did not believe it passed the wit of man to devise means whereby the University should become a teaching body and yet both maintain its present high standard and safeguard the interests of external students. Certainly those members of the Senate who were favourable to change were the last men who would wish to lower the degree standard. But he wished to point to a real danger. There could be nothing more fatal to the prestige and influence of their University than that there should arise by its side another University in London which should teach as well as examine; and if the choice lay between such a second University and the modification of the existing University of London, surely the latter alternative was preferable. The feeling in favour of a teaching University was so strong that in one form or another it must succeed in its aim, and surely it was wiser to look facts in the face than blindly to oppose the inevitable march of events.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, May 14.—Mr. Shelford Bidwell, President, in the chair.—Mr. W. Watson described an instrument for comparing thermometers with a standard. The thermometers to be compared are inserted together in an enclosed vapour-tube, the temperature of which can be maintained very constant at different parts of the scale. The apparatus is an adaptation of the arrangement designed by Ramsay and Young for vapour densities. It consists of a wide vertical glass tube, with a

narrower tube attached at the top. The narrow tube bends downwards, and communicates with a closed vessel of considerable volume. A portion of the vertical tube is surrounded by a condensing-jacket, and a manometer-tube is inserted near the top. The object of the large vessel is to diminish errors arising from fortuitous changes of pressure, resulting from small leakages or "bumping" of the boiling liquid. Electrical heating of the bulb containing the liquid, effectually removes the "bumping." The following liquids, used consecutively, give a range of temperature from 20° C. to 120° C.: carbon bisulphide (20° to 46°), ethyl alcohol (80°), chlorobenzene (120°). The apparatus when once started required very little attention; from results submitted by the author, the variations do not exceed 0.02° C. per hour. In constructing the various parts, the difficulties of glass-blowing are reduced by making the joints of india-rubber stoppers, attached to the glass with india-rubber solution. Each joint is jacketed with glycerine. If the above liquids are used in the vaporiser, the scales of the thermometer can always be read within the tube; it is only with water that the condensed vapour gives trouble. Prof. Ayrton thought the apparatus would come into extensive use; it did away with errors arising from differences of length of thermometer stems; it left no question as to the equality of temperature of the two bulbs; and there was no probability of error due to a difference of thermal "lag" in any two thermometers. Mr. Watson, in replying to a question of Prof. Perry's, said the fact of using india-rubber joints limited the available range of temperature. Working with blown joints, Ramsay and Young had found no difficulty with their vapour-density experiments at higher temperatures.—Prof. Carey Foster read a paper, by Mr. D. K. Morris, of Zürich, on the effect of temperature upon the magnetic and electric properties of iron. The investigation relates to the measurement of the magnetic permeability, hysteresis, and electrical resistance of iron, simultaneously, at different temperatures. The specimens are formed into annular rings, made from iron strip. The strip is first lapped round with asbestos paper and mica, and then wound upon itself to the required thickness. A platinum wire is included in the mica lappings, for thermometrical purposes. Upon each annular ring are the following windings: (1) a primary magnetising coil; (2) a secondary coil connected to a ballistic galvanometer; (3) an electrical heating coil. Further, the iron strip is itself connected to a Wheatstone's bridge, for resistance measurements. The coil can be heated to 1050° C. At the higher temperatures, the surrounding air has to be freed from oxygen; this is done by enclosing the coil in a suitable vessel, and exhausting with an air-pump. When most of the air has thus been removed, the residual oxygen is absorbed by an electrically-heated iron wire. Curves are drawn representing the changes of permeability at the different temperatures; and, at the same temperatures, the corresponding hysteresis loops are plotted. The hysteresis diminishes with temperature; it nearly vanishes at about 764° C. At the suggestion of Prof. Ayrton, it was agreed that the discussion on this paper should be adjourned until the publication of the results. The paper will, therefore, be printed without delay.—Mr. Rollo Appleyard read a paper on the formation of mercury films by an electrical process. If a sheet of damp leather, or similar permeable substance, is used as a separating diaphragm between two bodies of mercury, and a current is sent through it, a film of mercury is deposited upon the surface connected to the positive pole; and the film remains on the diaphragm after removal from the apparatus. If the diaphragm is replaced in the apparatus, and subjected to a current in the reverse direction, the film vanishes from that surface, and a second film appears on the other side; that is to say, the film is always on the side of the diaphragm connected to the positive pole of the battery, and there is no film on the negative surface. Different diaphragms and films were exhibited on filter-paper, asbestos-paper, plaster of Paris, &c. A current of about one-fiftieth of an ampère, or more, is necessary. A sheet of tinfoil included between folds of filter-paper becomes perforated with pin-holes when the current is passed between the outside surfaces. This happens whether the outside electrodes are mercury or metal plates. If the top electrode should be tinfoil, this also becomes perforated as well as the included sheet. A further experiment was shown in which a gold coin is placed upon the folds of filter-paper; the current produces a gold-discoloration which penetrates the folds. This, it was suggested by the author, may help to account for the formation of metallic lodes and veins as they exist in rocks;

and they may partly explain the "inductoscripts" of Mr. F. J. Smith. Dr. S. P. Thompson said he did not know of any other example of an anode being more active, mechanically, than the *kathode*, except the electric arc. He was surprised that the film should appear on the positive surface. Mr. Shelford Bidwell thought selenium presented, in some of its actions, an example of the anode being thus active. Prof. Ayrton said that if a vessel containing a substratum of mercury amalgam was filled up with water in which gold crushings were washed, the gold descended into the amalgam. This, however, might be due partly to gravity, and partly to simple electrolysis. Mr. Appleyard said he had no definite views as to the formation of the films. He believed it to be a secondary effect of electrolysis, aided by electric osmosis. The experiments of Mr. C. K. Falkenstein upon the electric tanning of leather, and the early results of M. Perret, helped the idea of electric osmosis; they were not sufficient, however, to justify that theory without further research. A careful chemical analysis of the deposits left in the folds of filter-paper would be the best guide.

EDINBURGH.

Royal Society, May 3.—Prof. Chrystal in the chair.—A paper on Dschäbir Ben Hayyân and the chemical writings ascribed to him, by Prof. Ferguson.—The seasonal changes in the pressure and temperature of the atmosphere from May to June, and November to December, by Dr. Buchan.—Dr. W. W. J. Nicol read a paper on supersaturation. After a short reference to his previous papers on supersaturation, in which the author showed that supersaturated solutions differ in none of their properties from ordinary solutions, if only the temperature be not allowed to fall below a certain point (depending upon the nature of the salt in question, and the concentration of the solution), and contact with the solid salt or with an isomorphous salt be carefully prevented, he repeated his statement that there is really no such thing as a supersaturated solution, that such solutions are in reality saturated or non-saturated solutions of what may be termed the anhydrous salt; that is to say, they contain the salt to which the *whole* of the water is similarly related, no distinction existing in solution between the water organically present as water of crystallisation, and the solvent water. The author proceeded to explain that he was forced into premature publication of his recent work on the subject, by the appearance of a paper by Ostwald in the last number of the *Zeitschrift für Physikalische Chemie* (see pp. 61-2.) In this paper, Ostwald was apparently on the verge of coming to the same conclusions as those at which the author had arrived as the result of his more recent work, thus no other course was open to him than the publication of the work in an incomplete form. The conclusion at which the author has arrived is as follows. Whenever, under the conditions of experiment, two allotropic forms of the dissolved or fused substance can exist, then supersaturation or superfusion, as the case may be, is also possible. In other words, allotropy is the cause of supersaturation. The term allotropy is used in a wider sense than usual; here it includes different crystalline or amorphous forms of a body brought about by the presence or absence of foreign molecules, and the statement is therefore applicable to cases of supersaturation involving hydrated salts, and also double salts. The experimental evidence in favour of the above, though incomplete, is already fairly large. The law is found to hold good not only with hydrated salts, but also with salts crystallising usually without water and with numerous organic compounds. Thus, allotropic forms have been found, and supersaturated solutions prepared, in the case of potassium nitrate, ammonium nitrate, silver nitrate, acetanilid, hydroquinone, acetamide, malonic acid, mandelic acid, resorcin, tartaric acid, citric acid (four modifications), and sodium chlorate, this last observed first by Ostwald. The author intimated his intention to examine further as to the limits, and to investigate the border region in which supersaturation can be terminated by shock or other mechanical means.—A paper on the geometrical investigations of the circular functions of 3θ and 5θ , by Prof. Anglin.—On some nuclei of cloudy condensation, by John Aitken, F.R.S. It has been claimed, the author said, by Helmholtz and Richarz, that "ions" were active in producing condensation in supersaturated vapour, and that these, along with dust, produced the ordinary cloudy condensation in the atmosphere. In an experiment by the author to test this conclusion, hydrogen was burned in filtered air, when it was found that, if precautions were taken to have the hydrogen pure and the air absolutely

dust free, the ions lost their power of producing cloudy condensation as soon as they were cooled. The products of combustion remained free from condensed particles, when expanded, and when the products were tested by means of steam near the combustion-chamber, while they were still hot, they showed very little power of condensing. It had been shown in a previous paper that sunshine gave rise to a great increase in the number of particles under certain conditions, and experiments, recently made, were described in which it was shown that, though sunshine has no effect in producing nuclei in ordinary air, yet, if any of the so-called impurities in the atmosphere be present there in the gaseous condition, the sunlight produces a great number of nuclei. It was found that if ammonia, peroxide of hydrogen, nitric acid, nitrous acid, or sulphurous acid, were present in the air, sunlight caused the formation of a great number of nuclei of condensation, showing that if any of these gases are present in the air, clouds would be produced, though there was no dust present, if the air became saturated.

PARIS.

Academy of Sciences, May 10.—M. A. Chatin in the chair.—The President announced the losses the Academy had sustained by the deaths of M. Des Cloizeaux and Mgr. le duc d'Aumale.—Explanations of some experiments of M. G. Le Bon, by M. Henri Becquerel. Experimental evidence is given showing that vulcanite is transparent to the red and infra-red rays, which, although without action upon an unexposed plate, are capable of continuing the action of the actinic rays upon a plate which has been exposed for a very short period of time. These red rays are also capable of destroying the phosphorescence of zinc sulphide, and their passage through the vulcanite affords a complete explanation of the observations of M. G. Le Bon, the assumption of the existence of a special kind of light, "dark light," being unnecessary.—On solutions of acetone and their explosive properties, by MM. Berthelot and Vieille. This paper is a lengthy one, and gives the pressures of acetylene dissolved in acetone at different temperatures and concentrations, the conditions under which dissolved acetylene explodes; and also acetylene gas in contact with its solution in acetone.—Remarks on the explosive decomposition of solutions of acetylene, by MM. Berthelot and Vieille. In the explosive decomposition of solutions of acetylene in acetone, the latter is also broken up into carbon, hydrogen, water, and the two oxides of carbon.—On some conditions of propagation of the decomposition of pure acetylene, by MM. Berthelot and Vieille. It was found to be impossible to obtain a critical pressure below which the propagation of the explosive wave did not take place, as in a series of experiments at a given pressure the wave was sometimes produced and sometimes not.—On the employment of four-dimensional space in the study of algebraic surfaces admitting several series of conics, by M. Eugène Cosserat.—On an analytical formula relating to certain integrals of elliptic functions with respect to their modulus, by M. F. de Salvert.—On the algebraic integration of linear differential equations of the third order, by M. A. Boulangier.—On the solubility of liquids, by M. A. Aignan. The method of Alexejew for the study of the mutual solubility of liquids is criticised, and a new method suggested which leads to a different definition of the coefficient of solubility. The formula deduced are applied experimentally to the case of ether and water.—On multiple resonance, by M. L. Décombe. The experiments cited entirely confirm the theory of resonators put forward by Poincaré and Bjerknes.—On the diurnal variation in the direction of the wind, by M. Alfred Angot. In order to get rid of the disturbing effects of surrounding buildings, the observations were carried out at the top of the Eiffel Tower.—Basic salts of cadmium, by M. Tassilly.—Researches on strontium sulphide, and on the method of obtaining it highly phosphorescent, by M. José Rodriguez Mourelle. The sulphide is prepared by heating a mixture of strontium carbonate, sulphur, sodium carbonate, sodium chloride, and bismuth sub-nitrate.—Thermal study of the sodium derivatives of acetylene, by M. Camille Matignon.—Contribution to the study of the preparation of ordinary ether, by M. L. Prunier. Some sulphonic acids are always present in addition to the sulphate and ethyl sulphate previously noted.—Action of chloral hydrate upon phenylhydrazine. Diphenylglyoxazol and its derivatives, by M. H. Causse.—On the effect of manganese in the oxidations induced by laccase, by M. Gabriel Bertrand. The presence of a manganese salt increases the

oxidising power of laccase to a remarkable extent. The author points out that the presence of minute traces of manganese in plants may be of great physiological importance.—On the fauna of the pools on the eastern coast of Corsica, by M. Louis Roule.—On a disease of orchids caused by the *Glaeosporium macrospus*, Sacc., by M. Mangin. After detailing the methods employed in ascertaining the presence of the *Glaeosporium* in the affected plants, measures are suggested for fighting the disease, chiefly the use of β -naphthol.—On the mode of formation of the primary dunes of Gascony, by M. E. Durège.—On the general course of glacial denudation, by M. Stanislas Meunier.—Experiments showing that the liver destroys dissolved hæmoglobin, and that it keeps the iron, by M. Louis Lapique.—The number of poisonous principles produced by a pathogenic microbe, by M. A. Charrin. The idea is attacked that a specific pathogenic organism produces one specific poisonous principle, its toxin, and experiments are quoted to show that one and the same species of microbe can produce several pathogenic compounds. Thus the pyocyanic bacillus is shown to produce several, easily distinguishable by their pathological effects.—On barley, by M. Balland. Some proximate analyses of barley.—On the dialysis of the alkaline humates, by M. J. Dumont.—Remarks on some properties of the oxydase in wines, by M. Bouffard.—Research on caramel. Possible confusion with coal tar-colours, by M. Antonio J. da Cruz Magalhães.

DIARY OF SOCIETIES.

THURSDAY, MAY 20.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture.—On the Mechanical Equivalent of Heat: Prof. Osborne Reynolds, F.R.S., and W. H. Moirby.
SOCIETY OF ARTS, at 4.30.—Kerman and Persian Beluchistan, with special reference to the Journeys of Alexander the Great and Marco Polo: Captain P. Molesworth Sykes.

CHEMICAL SOCIETY, at 8.—The Theory of Osmotic Pressure and the Hypothesis of Electrolytic Dissociation; Molecular Rotation of Optically Active Salts; Heats of Neutralisation of Acids and Bases in Dilute Aqueous Solution: Holland Crompton.—The Platinum-Silver Alloys: their Solubility in Nitric Acid: John Spiller.—A Comparative Crystallographical Study of the Normal Selenates of Potassium, Rubidium and Caesium: A. E. Tutton.

FRIDAY, MAY 21.

ROYAL INSTITUTION, at 9.—Contact Electricity of Metals: Lord Kelvin.
SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES (Tunbridge Wells), at 3.30.—What can be done to save our Fauna and Flora from unnecessary Destruction? Rev. J. J. Scargill and A. Rose.—How can the Technical Education Grant assist Local Scientific Societies? S. Atwood and J. W. Tutt.—Local Museums: Practical Observations on Objects and Methods: W. Cole and E. A. Pankhurst.
EPIDEMIOLOGICAL SOCIETY, at 8.

SATURDAY, MAY 22.

ROYAL BOTANIC SOCIETY, at 4.
GEOLOGISTS' ASSOCIATION.—Excursion to Erith and Crayford. Director: Flaxman C. J. Spurrell. Leave Cannon Street (S. E. R.) at 2.2.
LONDON GEOLOGICAL FIELD CLASS.—Excursion to Tunbridge Wells. Wealden Beds. Leave Cannon Street, 2.23; arrive Tunbridge Wells, 3.40.
SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES (Tunbridge Wells), at 11.—The Committees of Field Clubs: Prof. G. S. Boulger.—Current Bedding in Clay: Section at New Athletic Ground, Tunbridge Wells: Prof. H. G. Seeley, F.R.S.—Search for Coal in the South-east of England: H. E. Turner and W. Whitaker, F.R.S.—History of the Weald in special reference to the Age of the Plateau Deposit: W. J. Lewis Abbott.

MONDAY, MAY 24.

SOCIETY OF ARTS, at 8.—Design in Lettering: Lewis Foreman Day.
LINNEAN SOCIETY, at 3.—Anniversary Meeting.

TUESDAY, MAY 25.

ROYAL INSTITUTION, at 3.—The Heart and its Work: Dr. E. H. Starling.
ROYAL STATISTICAL SOCIETY, at 5.30.
ANTHROPOLOGICAL INSTITUTE, at 8.30.—A Quinary System of Notation used in Luchoo: Prof. Basil Hall Chamberlain.—Ancient Measures in Prehistoric Monuments: A. L. Lewis.—Probable Papers: Further Discoveries of Stone Implements in Somaliland: H. W. Seton-Karr.—The Berbers of Morocco: W. B. Harris.—Rock Paintings and Carvings of Australian Aborigines: R. H. Mathews.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—The Optical Effects of Intensification: Chapman Jones.—Some Notes on the Correct Rendering of the Colours of Flowers: H. T. Malby.

ROYAL VICTORIA HALL, at 8.30.—Growth of the Colonies in the Queen's Reign: O'Donnell.

WEDNESDAY, MAY 26.

GEOLOGICAL SOCIETY, at 8.—On Augite-Diorites with Micro-Pegmatite in Southern India: T. H. Holland.—The Laccolites of Cutch and their Relation to the other Igneous Masses of the District: Rev. J. F. Blake.
BRITISH ASTRONOMICAL ASSOCIATION, at 5.

THURSDAY, MAY 27.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Annual General Meeting.

FRIDAY, MAY 28.

ROYAL INSTITUTION, at 9.—The Isolation of Fluorine: Prof. H. Moissan.
PHYSICAL SOCIETY, at 5.

SATURDAY, MAY 29.

LONDON GEOLOGICAL FIELD CLASS.—Excursion to Sheerness. Drive to East Church, Hensbrook. London Clay. Leave Holborn Viaduct, 1.25.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Exercises in Practical Physiology: Dr. A. D. Waller, Part 3 (Longmans).—Milk and its Products: Prof. H. H. Wing (Macmillan).—The Theory of Electricity and Magnetism: Prof. A. C. Webster (Macmillan).—The Elements of Physics: E. L. Nichols and W. S. Franklin, Vol. 3 (Macmillan).—Prehistoric Problems: Dr. R. Munro (Blackwood).—A Great Agricultural Estate: The Duke of Bedford (Murray).—The Localisation of Faults in Electric Light Mains: F. C. Raphael (Electrician Company, Ltd.).—The Birds of our Country: H. E. Stewart (Digby).—Handbook for Jamaica for 1897 (Stanford).—Reports from the Laboratory of the Royal College of Physicians, Edinburgh, Vol. 6 (Edinburgh, Clay).—Memories of the Months: Sir H. Maxwell (Arnold).—Government of India, Department of Revenue and Agriculture. Accounts of the Trade carried by Rail and River in India, 1895-96, and the Four Preceding Years (Calcutta).—Electromoteurs et Leurs Applications: G. Dumont (Paris, Gauthier-Villars).—The Development of the Frog's Egg: Prof. T. H. Morgan (Macmillan).—Flowering Plants: Mrs. A. Bell (Philip).—First Stage Mechanics of Fluids: Dr. G. H. Bryan and F. Rosenberg (Clive).—Social Transformations of the Victorian Age: T. H. S. Escott (Seeley).—Topographische Anatomie des Pferdes: Profs. Ellenberger and Baum, Dritter Teil (Berlin, Parey).—Report on the Geological Structure and Stability of the Hill Slopes around Naini Tal: T. H. Holland (Calcutta).—Leçons sur l'Électricité et le Magnétisme: Prof. E. Mascart, tome deuxième (Paris, Masson).—Essai sur les Éléments de la Mécanique des Particules: H. Majert, 1^{re} Partie: Statique Particulière (Neuchâtel, Attinger).

PAMPHLETS.—Geological Survey of Canada: Report on the Country between Athabasca Lake and Churchill River: J. B. Tyrrell and D. B. Dowling (Ottawa).—Ditto: Report on Explorations in the Labrador Peninsula along the East Main, &c., in 1892, 1893, 1894, and 1895: A. P. Low (Ottawa).—Resultate aus den Beobachtungen des Veränderlichen Sternes η Aquilae: W. J. S. Lockyer (Göttingen).

SERIALS.—Transactions of the Astronomical and Physical Society of Toronto, 1896 (Toronto).—Palaeozoic Fossils: J. F. Whiteaves, Vol. 3, Part 3 (Ottawa).—Engineering Magazine, May (Tucker).—Proceedings of the Royal Society of Victoria, Vol. ix., new series (Melbourne).—Quarterly Journal of the Geological Society, Vol. lxxi, Part 2, No. 210 (Longmans).—General Index to the First Fifty Volumes of the Quarterly Journal of the Geological Society, Part 2 (Longmans).—Journal of the Institution of Electrical Engineers, No. 128, Vol. xxvi. (Spon).—Memoirs of the Geological Survey of India. Palaeontologia Indica, ser. xvi. Vol. 1, Part 1 (Calcutta).—Memoirs of the Geological Survey of India, Vols. xxv. and xxvi. (Calcutta).—History of Mankind: F. Ratzel, translated, Part 19 (Macmillan).—American Naturalist, May (Philadelphia).—Journal of the Franklin Institute, May (Philadelphia).—Psychological Review, May (Macmillan).—Ditto, Psychological Index, No. 3 (Macmillan).—Journal of the Chemical Society, May (Gurney).—English Illustrated Magazine, June (198 Strand).

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